THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MARCH 26, 1896 CHICAGO, ILL. NUMBER 13.

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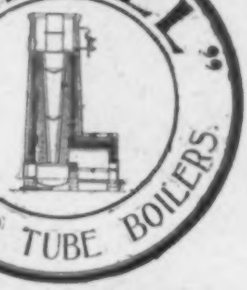
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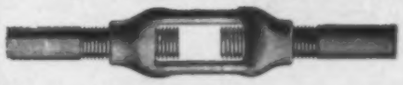
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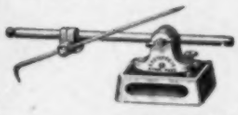
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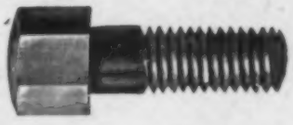
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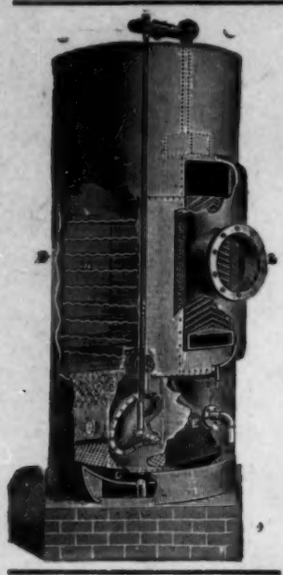

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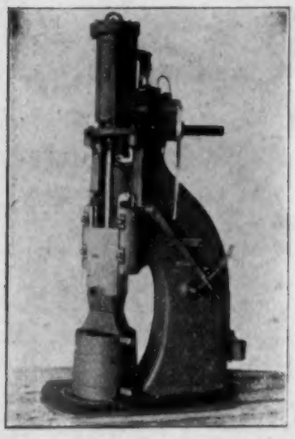

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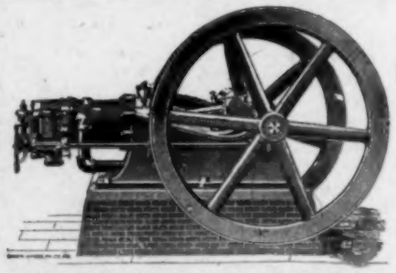

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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. MARCH 26, 1896. CHICAGO, ILL. NUMBER 13.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The important event of the week was the announcement of the price for 1896 of Lake Superior Bessemer ores. The base is the expected $4 for Norrie ore. For the best Mesabi product $3.75 is the figure, other ores on that range scaling down from 10 to 70 cents below this price. The output of Bessemers, it is now expected, will be about 20 per cent less than the amount talked of in December. Something may come yet of the talk of a better basis for non-Bessemer ores also, but there is no action in that direction as yet. The market response to the definite announcement of the increased cost of Bessemer furnace burdens is not yet strongly defined. Such a market could not quickly respond to any impulse toward higher prices. The probability of the $4 basis has been before the producers of Bessemer pig iron for several months. The question each had to decide was how far present necessities required the surrender of the enhanced value of old ores on hand. With $4 ore and $2 coke the average valley furnaces can scarcely figure a cost below $12.50; with some this basis will be exceeded. The past few days have shown a stronger feeling in the Pittsburg market. While one sale last week was at $11.75 Pittsburg, with the market quoted $12 to $12.25, some business has been done this week at the latter figure, or 50 cents in advance of the lowest point. On deliveries extending through June $11.75 in the valley is minimum. Billets are firmer on later deliveries, with $17.25 as the Pittsburg basis, though a sale in the Cleveland district is reported to have made at the lowest price of the year. Southern furnaces have had a week of heavy business in forge iron, with pipe works and rolling mills, and several contracts for foundry grades were made by buyers who appreciated the situation. Gray forge at $6.30, Birmingham, No. 2 foundry at $7.25 and No. 1 at $8, represent heavy cuts from the previously quoted basis for Southern iron. The tonnage closed, which with one Cincinnati agency amounted to 50,000 tons, has put the furnaces in such a position that there will be no scramble for business in the next two months, and the early withdrawal of the low quotations is predicted. The sales above referred to included 10,000 tons to a pipe concern, and 5,000 tons of basic iron to a Central Western steel works. The situation in finished material has not improved in the week. On plates some weakening is apparent. Orders booked by the rail mills are increasing, Western business leading. The 10,000-ton rail order for Japan, taken by a Western mill at a low price, is to be rolled at Pittsburg. On the pending contract for 4,000 tons of open-hearth plates for a Massachusetts water conduit, revised bids have been called for, and the low figures already in may be shaded.

THE CLEVELAND DISTRICT.

The position of the Lake Superior Bessemer ore interest for 1896 has been definitely announced within the past few days, both as to the basis of prices and the probable production. For standard Gogebic Bessemer ores like the Norrie and Tilden $4 will be asked. Aurora, on the same range, will have its usual relative advance over the price of the two first named. For high grade soft ores of the Vermilion range, $4.25 will be the price. The hard ores of the Vermilion and Marquette ranges will carry the same proportionate advance over standard hematites as in 1895. On the Mesabi range the maximum will be $3.75 for Franklin ore, with $3.65 for Biwabik, and other prices scaled according to quality, the minimum being $3.05. For the Chapin the figure is $3.65. The output of 9,700,000 tons of Bessemer, originally expected, will be reduced to about 7,750,000 tons. In the reckoning for the coming year no account is taken of dock stocks. The amount that will remain on dock May 1, it is figured, is not more than should be carried regularly as a precaution against interrupted transportation, either through mine or dock or other strikes in the upper lake country. As intimated in these columns recently, the calculations of those who have figured on a total ore movement of 12,000,000 tons in 1896 are likely to be disappointed. It is said to be the intention of shippers to keep shipments close to the total of ore sold. There is no new chartering, though offers of tonnage have been made at $1.10. Shippers are not considering the question in the absence of ore sales, though it is quite certain that they would take some tonnage to-day if available at $1.

Pig Iron. Furnacemen have extracted some encouragement from the better feeling in the Bessemer pig iron market the past week. Sales have not been of large volume, but prices offered are from 50 to 75 cents better than the lowest reported in the past two weeks. At Pittsburg the quotation is $12.25 to $12.50 and an offer of $11.75, valley furnace, deliveries in the next three months has been refused. Making a certainty out of what has been generally regarded as a probability concerning the Bessemer ore price, has apparently stiffened the market, if it has not stimulated buying. The accumulated stocks at furnaces are in the way of any pronounced advance, but furnacemen in general are quite averse to giving away all the prospective value the ore announcement has added to their stocks on hand. Foundry irons seem to be governed by the ability of the buyer and seller to agree on a price. For No. 2 strong foundry, valley furnaces quote $11.50 to $11.75, but the lower figure has been shaded. Southern irons have been sharp competitors of late, and at $7.25 Birmingham, Southern No. 2 can be laid down at $11.15 Cleveland, while gray forge at $6.30 Birmingham gives Southern mill irons not a little trade naturally tributary to Pittsburg and the valleys. A 5,000-ton sale of Southern basic iron is reported at a figure close to $11.25 delivered in Cleveland. There is little doing in Lake Superior charcoal. Indications appear of an effort by sellers to establish uniform prices. For the present we quote $13.50 to $14, at lower lake port.

Finished Material. A slight improvement over the volume of business in the few preceding weeks has been noticed in the local market, but no betterment in prices. No contracts involving any considerable tonnage are reported, but demand is better distributed. Valley iron mills are better employed than in the earlier part of the month, though this is not saying much for any of them. The hoop and band manufacturers have succeeded,

Continued on page 6.

THE CHICAGO DISTRICT.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The situation in this territory seems to have changed but very little from last week, the market remaining very quiet in nearly every branch. Sales have been small and prices in almost every instance are weak. There is still expressed a hope by the mill and furnace agents that a change for the better will come in the near future, and there are some indications that this change may be expected within a short time. A report comes from Cincinnati that very large sales of pig iron have been made there, and that as a consequence prices of Southern iron may be stiffened materially within a few days. Complaints are heard that a short interest is responsible for the cutting of Southern pig iron prices, and that some dealers are selling at considerably lower figures than furnaces would be willing to make. The steel market has been very quiet, and the largest business outside of rails was in rods, of which orders for 3,000 tons have been taken.

PIG IRON.—Very much the same conditions prevail as in the week before. Buying is light and prices weak. Local furnaces are maintaining quotations fairly well, but Southern furnaces have reduced their prices again, and it is doubtful if the figures we give represent the actual minimum. Orders were very scarce, and the larger portion of them were carload lots with only a few for 200 to 300 tons. Our quotations are revised as follows:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$11 10@11 35
Local Coke Fdy. No. 1	12 50@13 00	South'n Silveries No. 1	11 85@12 35
Local Coke Fdy. No. 2	12 00@12 50	South'n Silveries No. 2	11 60@11 85
Local Coke Fdy. No. 3	11 00@12 00	Jackson Co. Silveries	14 50@16 00
Local Scotch Fdy. No. 1	12 50@13 00	Ohio Silveries No. 1	15 00@15 50
Local Scotch Fdy. No. 2	12 00@12 50	Ohio Silveries No. 2	14 50@15 00
Local Scotch Fdy. No. 3	11 00@12 00	Ohio Strong Softeners	15 00@15 50
South'n Coke No. 1	11 85@12 35	Alabama Car Wheel	16 85@17 35
South'n Coke No. 2	11 35@11 60	Malleable Bessemer	13 00
South'n Coke No. 3	10 85@11 35	Coke Bessemer	13 00@14 00
Southern No. 1 Soft	11 35@11 60		

BARS.—The Merchant Bar Iron Association has apparently lost its hold on the majority of its members, as association mills have been cutting the prices made by the association for some time, and are now doing it openly. The prevailing quotation on common iron is now 1.20c to 1.30c f. o. b. Chicago; for guaranteed 1.25c to 1.35c and for soft steel bars 1.30c to 1.40c. Very little business has been done, and buyers who are in the market for round lots are doing their best to force sellers down to the bottom notch before placing their orders. One lot of 1,000 tons was offered to several mills last week at figures considerably under those given, but none would take it.

RAILS AND TRACK SUPPLIES.—Local mills are well supp'ied with orders for rails, having booked a tonnage this year very largely in excess of that taken in the same time in 1895. The general run of business is small, but within the past two weeks one of the large Southern roads placed an order with the Illinois Steel Co. for over 40,000 tons of rails. Quotations are made at $29 for rails; splice bars, 1.40c to 1.50c; track bolts with square nuts, 2c to 2.05c; hexagon nuts, 2.17½ to 2.25c; spikes, 1.75c to 1.80c.

BILLETS AND RODS.—Billets were very quiet last week, no sales of any consequence having been made. 3,000 tons of rods were sold by the local mills at $25, and other orders are in prospect. Billets are quoted at $19.50 to $20.

STRUCTURAL MATERIAL.—Local business was very quiet, no large contracts having been placed and general business having fallen off to quite an extent. Prices are rather weak but are unchanged as follows: Beams and channels, 1.70c to 1.75c; angles, 1.55c to 1.60c; plates, 1.60c to 1.65c tees, 1.70c to 1.75c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—Local mills report only a small business, and that they are not desirous of taking very much at present quotations. Trade is quiet and no orders of any consequence were placed. Quotations are inclined to be weak and are made as follows: Tank steel, 1.60c to 1.65c; flange steel, 1.85c to 1.90c; fire-box steel 2.85c to 5c; boiler tubes, 70 to 75 per cent discount.

SHEETS.—The market has been quiet and sales have fallen off considerably. It is thought that business will be better within a few weeks, as the local spring trade will probably assume its proper proportions. No. 27 black is quoted at 2.35c to 2.40c and galvanized from 80 per cent to 75 and 10 per cent discount.

MERCHANT STEEL.—Orders for mill lots are very scarce and only a few small ones were placed last week. Business from store is quiet, but dealers expect it will be better with'n a few weeks. Prices are unchanged: Open-hearth spring, tire and machinery steel, 1.95c to 2.05c; smooth finished machinery steel, 1.70c to 1.75c; smooth finished tire 1.65c to 1.70c; tool steel, 5 50c to 7.50c; specials, 11c and upwards; Bessemer bars, 1.55c to 1.65c.

OLD RAILS AND WHEELS.—Very little business in old material has been done and prices are only nominal. Old wheels, $13.25 to $14; old steel rails, $10 to $11; old iron rails, $14.

SCRAP.—Dealers report a very small business and a decreasing demand. The following are buying quotations furnished by dealers: Railroad forge, $12 to $12.50; dealer's forge, $10 50 to$11; No. 1 mill, $7.50 to $8; railroad cast, gross ton, $9.50 to $10; machinery cast, $10 to $11; axles, $14.50; cast borings, $5; wrought turnings, $5.50; axle turnings, $6; mixed steel, $9; stove plates, $6.50; heavy melting steel, $10.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The week has brought a better tone and some advance to the market for Bessemer iron. The publication of the result of the final meeting at Cleveland Saturday, of the Bessemer ore interests created no sensation, as the $4 price for Norrie ore had been predicted for some time. While here and there the opinion has been expressed, in the past few weeks, that the proposed $4 basis was higher than should be expected in view of the change in the market since December and the present low state of the iron industry, it has been conceded that in view of the announced determination of the Connellsville coke interest to adhere to $2, there would hardly be a revision of the early calculations about ore. The reduction in the proposed output, from nine and three-quarters millions to seven and three-quarters millions, is regarded as in line with present indications as to the year's business. The sales of Bessemer iron in the present week, while not of large volume, indicate that prices are stiffening. There is no more iron to be had, apparently, at the extreme price reported last week. While $11 in the valley was shaded in one instance a week ago, a round sale was made in the latter part of last week at $11.85, Pittsburg, prompt delivery, and later sales, with deliveries through April and May, are reported at $12.15 and $12.25 Pittsburg. One valley furnace is reported to have obtained better than $11.50 at furnace for April and May delivery. Billets are dull and there is little chance for immediate activity, in view of the amount of steel on the books of the makers for which they cannot obtain specifications. In finished material some mills report a fair run of small lot business. A 4,000 ton order for open hearth plates for New Bedford, Mass., water course brought out low bids from both Pittsburg and outside mills, with

indications that a local mill will get the business. On structural material we still quote 1.45c for beams and channels, and 1.25c@1.30c for angles. Plates are not so firm. We quote 1.30c for tank. On bar iron and bar steel prices are a shade lower. On the latter, business is done at 1.10c, though some mills continue to quote 1.15c. On bar iron quotations range from 1.10c to 1.20c for common at mill. Sheets continue in unsatisfactory condition. On No. 27 2.05c to 2.15c is the quotation, and even a shade lower price has been made on prompt sales. Considerable forward business is booked. Foundry irons are weak, and low Southern quotations in outside markets have unsettled values. We quote $12.75 @$13 for No. 1 and $12@$12.50 for No. 2, with sales confined to small lots. In forge there has been more activity. One concern bought 10,000 tons last week, the greater part of it at $10.90. Southern quotations have been considerably below the basis of local furnaces.

Cincinnati. The Alabama furnaces that have been trying to maintain prices in the face of adverse conditions, have recognized the situation and on grades of which there has been an accumulation, have authorized prices to meet Northern and Eastern competition. This has resulted during the past week in the placing of a heavy tonnage, principally to consumers in the central districts. For several months past, rolling mills have bought sparingly, but during this week have been very prominent in large transactions. If demand continues for a few days more, the Birmingham furnaces will have their order books well filled for mill grades, and be in a much more independent position. There seems to be no regular schedule of prices. Each company is working on its own basis and the market is therefore irregular. Some of the large buyers have been able to cover their requirements during the next six months at prices that will net the furnaces very little if any above present cost. This buying movement has not extended very far East or West, but it is thought that its effects will be felt later. There has been no marked increase in demand for foundry grades, and the rank and file of small buyers have not yet actively come into the market. Charcoal irons have been sold in about their usual proportions. Collections are fairly good, considering the tightness of money in various sections of the country. Although failures in general lines of business are above the average, comparatively few iron consuming concerns have failed

Buffalo. The pig iron market in this vicinity is still a waiting one, which applies to both producer and consumer. Castings have recently sold at close to the lowest figures of a year ago, when pig iron and coke were lowest, yet there is a much larger demand and foundries generally are fairly busy. Many are full of work. Northern manufacturers of pig iron appear to be "between the devil and the deep sea." On the one hand higher prices are asked for this season's ores and on the other is a market which refuses to respond to efforts to raise it to this new level of cost. These conditions are shaping toward a sharp reduction of output until one side or the other gives way.

F. H. Buhl, of the Sharon Iron Works, Sharon, Pa., has sued John Stevens, manager of the Midland Steel Co., at Muncie, Ind., for alleged violation of a contract that he claims Stevens entered into, whereby Buhl was to furnish all the materials and machinery for making polished sheet steel by a process of which Stevens was the inventor, and they were to divide the profits.

The Georgia Mining & Mfg. Co. has leased and will develop the Guiton red hematite ore deposits in Alabama.

AMERICAN ANVIL MANUFACTURE.

The extent of the anvil trade in this country and the method of manufacture are probably not generally known. Previous to 1891, the wrought iron anvils used in the United States were imported from England, Germany and Sweden. For the 10 years preceding 1892, the average importation per year was 830 tons. The highest record was 959 tons in 1888. Several attempts to manufacture anvils in this country are on record, but the real birth of this industry, now so firmly established, dates from 1891. Its growth in 1892 and a part of 1893 was rapid. In 1894 the importations were only 380 tons, and in 1895 estimated at 500 tons, while the consumption for each of these years averaged about 800 tons. This shows a satisfactory progress for the American manufacturers. It is judged that the consumption for the present year will reach at least 800 tons, and it is believed that 600 tons of this amount will be produced at home.

Reference is had in the above to wrought anvils only. Cast iron anvils with steel faces have been successfully manufactured in this country for many years. Their quality is excellent, and they answer well for many purposes. Formerly, wrought iron anvils were built up of six pieces welded to a central core—four corner pieces, the heel piece and the horn piece. These six parts were welded to the core, and the whole then hammered and shaped. The steel face was then welded on, and tempered and ground. This method was generally pursued in the manufacture of foreign anvils, but more recently improvements have been adopted, so that a less number of pieces enter into their construction.

American manufacturers have discarded old-world methods entirely. For illustration, we refer to the methods used by the manufacturers of the anvil known as the "U. S." With improved furnaces for heating the blooms, ponderous steam hammers for forging, steel dies for shaping the heel and horn, new processes for tempering and grinding, novel appliances for swinging the anvil as required in the course of construction, they produce a superior article. In the manufacture of the "U. S." anvil, the material is selected and piled to form a bloom of sufficient size to produce the entire upper half, including the heel and horn, and a separate one to form the entire lower half. These piles are run into a furnace, and when heated to the proper degree become blooms, which are brought under a steam hammer and each shaped and punched and then welded in the center. Next the steel face is welded on, only special American crucible cast steel being used, and the anvil is swung to another hammer for the finishing strokes. Then follows the tempering of the face by a process originating in this plant, which insures even and perfect results, with a great saving of time in handling. After this come the testing, inspection, japanning, labeling and bagging, and a warranted anvil is ready for the market. The success of this comparatively new industry is gratifying. Every such effort to turn American capital and labor into new channels adds by so much to home prosperity and assists to the success of associated industries.

Increasing Shop Use of Compressed Air.

In the Union Pacific shops at Omaha compressed air is used for sandpapering the sides of cars. A sandpapering disc is caused to rotate at about 2,500 revolutions per minute. The New York Central & Hudson River Railroad uses compressed air in its West Albany shops on all benches for cleaning injectors, checks, cocks and all classes of work that require cleaning. The Southern Railway Co. uses compressed air for such work as sandblasting, loading and unloading heavy supplies, such as car wheels, etc., raising and lowering cabs, and many other purposes. Mr. J. H. McConnell, of the Union Pacific system, says: "We are constantly finding more uses for compressed air, and at the present time we find that it would be an impossibility to get along with our work without its use."

THE Cleveland-Cliffs Iron Co. has started fires in its charcoal kilns at Gladstone, Mich., adding daily to the number active. It is expected that the entire battery of 40 kilns will be in operation shortly. When a sufficient stock of charcoal has been accumulated the stack will be blown in. It is expected that iron will be made at the furnace and wood alcohol at the chemical plant by the end of the present month.

THE IRON TRADE REVIEW

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MARCH 26, 1896.

THE BAR IRON SITUATION.

As stated in our market columns last week, the Merchant Bar Iron Association agreement is no longer effective, so far as fixing a price for bar iron is concerned, and the mills have been making prices according to their own judgment or their anxiety to get a share of the very moderate business going. In the effort to organize a pool a vast amount of hard work has been done, a half dozen protracted conferences having been held, but there are not as yet any strong indications of success. While an organization still exists, and the agreement not to sell to consumers or jobbers who refuse to fulfill their contracts on a falling market is effective, it is but a step to formal dissolution, unless a way is opened through present obstacles.

The pool plan, on which a committee has been working for the past two months, has the assent of 86 per cent of the tonnage west of Pittsburg, and would become effective if about five per cent that is favorable to an agreement, but not the sort of an agreement proposed, could be induced to sign. The plan involves an allotment of tonnage, on the basis of the relative capacity and efficiency of the various producers, with a penalty for over-filling and allowances for under-filling. The small outstanding tonnage that is in the way of the consummation of the pool plan, opposes the proposition for a fixed price, made by the pool, at all delivery points, and insists on open prices, with a pool tax as a restraint on over-selling.

As long as demand continues to halt, and even the best equipped plants have little opportunity to name prices, the absence of an agreement makes little difference. Whether a revival of business will bring an adjustment of present differences remains to be seen. The reports that cropped out while the last agreement was in force, of the occasional shading of prices by an association mill may have something to do with the hesitancy of some interests now. Another objection to a fixed price is the encroachment of steel bars, on which there is no agreement as to price, contracts having been taken for steel in the latter part of 1895 at from $1 to $3 a ton below the Bar Iron Association price.

At the time of its formation the Merchant Bar iron Association faced the most demoralized state into which the bar iron market had fallen. Prices were cut below cost, the financial needs of one or two Western concerns being responsible for a quotation as low as 85c, and it is known that 82½c was done on one Northwestern Ohio sale. Added to this deplorable competition, was the growing license of buyers in the matter of contracts, throwing all risk of market fluctuations on the seller. If the market went up, he filled his low-price contracts; if the market went down he was forced to compromise or cancel old contracts or go to law and lose a customer. Then the laxity on extras and the practice of cutting to any lengths at the mill, throwing all waste on the manufacturer were still further adding to his hardships. The movement that started about a year ago to reform these abuses has brought about a far healthier condition in the trade, and it is greatly to the credit of the leaders that they have put a stop to doing business at a loss, and that on the matter of extras, at least, they have succeeded in getting an agreement that is national.

The first move toward better prices was made about April 15, 1895, when the Merchant Bar Iron Association established 1c as the minimum for common iron at valley mill. By the latter part of May the scheme of establishing delivered prices was perfected, and 1.05c, Cleveland and Youngstown, was established. About June 10 an advance was made to 1.10c; early in July to 1.20c; in the last week in July to 1.30c, and at the Cleveland meeting of Sept. 3 the top notch was reached at 1.40c. Every advance but the last one was acquiesced in by the trade. The rapid upward movement of steel seemed to justify each successive step. But at 1.40c, Cleveland and valleys, demand halted, and comparatively little business was done through the fall. The mid-December meeting of the Association made a reduction to 1.25c and there was a special price of 1.20c through January, to stimulate business. But business did not come as anticipated—it has not yet come, in fact—and since the early part of the year non-association mills have been getting a good share of what was going.

In reviewing the career of the Merchant Bar Iron Association, we are not of those who might write it down as another unsuccessful attempt to go against the natural laws of trade. The policy of *laissez faire* may be theoretically correct; but we believe there are conditions under which the restraint of destructive competition is a more imperative necessity than the enforcement of written or unwritten laws against so-called restraint of trade. There are oppressive agreements; but there can be also justifiable, and in the main, salutary agreements. While it may be argued that organizations to fix prices have eventually been disrupted, it cannot be said that they have left the trade in any worse condition than that in which they found it, nor can it be denied that, while they lasted, they have been useful in giving stability to the trade and in securing the profitable operation of the works included.

Of the Merchant Bar Iron Association, it is to be said that it has succeeded in reforming abuses that sadly needed correcting, and that, in the main, it has benefited not only its membership, but associated lines of trade. With one exception its advances of price were approved by consumers, and its service to sellers in other lines in putting contract-breaking under the ban is not to be lightly regarded. It would certainly be a calamity to the bar iron trade, if it should now be allowed to lapse into the state in which the Merchant Bar Iron Association found it.

THE CLEVELAND DISTRICT.—Continued from page 3.

through organization, in making an advance effective, some sizes being pushed up $4 a ton. The wrought pipe trade has also scored a slight advance; while extra discounts have been four 10s. and 5 on all sizes, small pipe now takes but four 10s. On bar iron we still quote 1.20c, Cleveland. March business has been of about the same volume as for March of last year, and the prospect is not as bright as might be desired. Sheet mills are only fairly employed, and while there are some low prices on prompt business, they are not disposed to make concessions on forward contracts. In billets, wire rods, wire and wire nails there are no new developments locally. On billets, $17.25, Cleveland, is the nominal quotation, though this has been shaded recently. The wire nail agreement seems to be under severe strain.

THE EFFECT OF COKE OVEN CONSTRUCTION ON COKE.*

BY R. M. ATWATER, SYRACUSE, N. Y.

Prof. J. P. Leslie describes the well known Pittsburg vein of coal as follows:

"The Pittsburg region is an outspread of the Pittsburg coal bed, 50 miles long by 50 miles wide, within the limits of the State of Pennsylvania. An average of eight feet in thickness for the whole region looks like a fair one. This gives 8,000,000 tons per square mile, and there are 2,500 square miles. Allowing 50 per cent of the area to be interval, and 50 per cent for pillars and bad mining, we may set down this coal, available for market in the future, at 5,000,000,000 tons."

On this basis, 2% of the Pittsburg coal is contained in the Connellsville vein, counting it all as standard, and not over 1% of the high grade standard coking coal; yet this 1% of Pittsburg coal yields 75% of all the coke made in Pennsylvania, over 8,000,0000 tons in 1895.

The object of my paper is to offer methods of coking the Pittsburg coal, which will enlarge the boundaries of the standard coking coal to all of the Pittsburg coal fields that bear coal of standard chemical composition. The available coal left in the Connellsville field is estimated to produce about 70,000,000 tons of coke, which, at the 1895 rate, will last 10 to 12 years. It is, therefore, only a question of a few years when other coals must be used, especially if the consumption of coke increases as it should increase, and the United States produce coke for the whole western hemisphere. There is, therefore, in the broad view of the question, no controversy between the Connellsville beehive oven and the retort oven. The existing ovens will have completed their useful life before the adjacent coal is exhausted. So, without sacrifice, they will disappear, and the new construction will take the form of the retort oven. It is this gradual and economical merging of the old method into the new which I desire to present and advocate.

The beehive oven makes no provision for the physical improvement of the coke. It is a broad, shallow basin, in which the coking coal follows out its own natural course. So far as the quality of the coke depends upon the oven, it is as primitive and unimproved a construction as when it was first devised. Consequently, the beehive oven is a happy go-lucky oven, and in the lottery of its application the prize fell to the narrow and limited Connellsville valley, or, more strictly, to the middle of this valley, for both the north and south end are not of equal quality with the so called "standard coke."

In this fortuitous application of the beehive oven, great regions of coal of equal chemical purity with Connellsville have lain dormant, or even sold at lower prices, because they did not make hard coke. If this one lacking quality of structural strength can be added to the coke, it will bring areas of coal land 10 times as large as the Connellsville field up to the Connellsville grade for coke. This will add 25% to the value of such fields.

Beehive and Retort Ovens Compared.

In the beehive oven a shallow basin 12 ft. in diameter is filled with coal to the depth of 24 inches. As it gradually fuses into coke, the mass swells to a height of about 30 inches. If, on quenching, it falls back to about the original bulk, it makes a hard coke. If it does not, it makes a soft coke. This is the apparent difference between the Connellsville coke and the coke from the Pittsburg vein.

Comparing this operation in the retort oven, which is a narrow chamber about 18 inches wide and six feet high, when the coking coal swells it cannot expand. It is compressed laterally between the narrow oven walls, and vertically by the overlying weight of over five feet of coal. The result is that the coke which is soft when coked in beehive ovens is hard when coked in retort ovens.

Further, the hydro-carbon gases, escaping through the mass of the coke in the beehive oven, form vertical passages or cells, and make their way in channels like the cells in a cornstalk, or other endogenous plant. These correspond to the cells of the coke structure. As they are parallel to the lines of pressure of the overlying coal, they have free course, and assume their full size. On the other hand, in the retort oven, the volatile gases pass off first horizontally from the sides of the oven, and uniting in the central part of the mass, pass up to the outlet of the oven through a middle line of cleavage. The whole weight of the overlying mass of coal presses upon these passages vertically, and so compresses the cells, and adds to the density of the coke. The result is, therefore, clearly evident that the retort oven adds density and structural strength to the coke. It will, therefore, carry a heavier burden in the furnace, both in actual height of charge and in the proportion of ore to coke, without giving away.

This improvement in the physical quality of the coke is accompanied by a further improvement in its chemical composition. The three characteristic impurities of coke are sulphur, phosphorus and excess of ash over that required for structural strength. In the beehive oven, not only is all the surplus volatile wasted, but there is a greater or less destruction of the fixed carbon. This varies with good or poor operation of the ovens from 5% to 40%. This loss is inevitable with an internally fired oven.

On the other hand, in the retort oven, there is an actual gain in the amount of coke produced over the theoretical yield of the coal in the fixed carbon and ash. This gain is caused by breaking up the hydro-carbon gases and the deposit of graphitic carbon on the surface of the coke. This gain amounts to from 5% to 15% over the ordinary practice of beehive ovens.

In proportion as the product of coke from the retort oven exceeds the product from the beehive oven, the amounts of sulphur, phosphorus and ash in the retort coke will be decreased, since these impurities start from the coal, and remain to a large extent in the coke.

We may, therefore, sum up the effect of the coke oven construction on the resulting coke as follows: The yield of coke will be increased by the greater rapidity of coking, which never exceeds 24 hours, and may often require only 16 hours, and also by turning part of the volatile into coke. Second, the quality of the coke is improved chemically, by reducing the impurities, and physically by increasing the structural strength of the coke.

Considering the Fourth Pool coals as tributary to the Pittsburg and Valley region; the coals of the Upper Monongahela and West Virginia as tributary to the blast furnaces in the Ohio Valley; the Western Maryland coals as tributary to the Eastern Pennsylvania and Maryland furnaces; and the Pocahontas coals as tributary to the Virginia and Western furnaces—the results are of fundamental importance. The improvement in the quality of the coke produced should raise the value of the coke by at least 25%, and the increase in the product of coke, which may be fairly stated from present common practice as 20% is equivalent to a profit of 20 % over that obtained by present methods. For every five tons of coke produced by present practice, one additional ton will be produced by means of the retort oven, and this extra ton, requiring no extra mining or manipulation up to the time of shipping, is all profit.

Still, it must not be forgotten that no oven will make good coke out of poor coal. The fountain cannot rise higher than its source. I have no doubt that the retort oven will produce coke better than Connellsville from coals that are better than Connellsville, if such can be found. The test of 1,500 tons of Semet-Solvay coke from Connellsville coal at the Buffalo furnace demonstrated conclusively that a coke which did not represent the best practice of the retort oven was equal in the blast furnace, both in calorific power, in burden-bearing, and and in the quality and amount of the iron produced, to the best, selected 72-hour coke that the Connellsville region was able to offer. This is the verdict of the able and impartial umpire, Mr. John Fulton, in his report to the Johnson Co., in whose interest he conducted the test. When the retort oven shall have been developed to its fult possibilities on Pittsburg coals, as the beehive oven has been, a new standard coke will be the result, and the beehive may not be in it.

The Semet-Solvay Retort Oven.

Among the various retort ovens that are offered to American engineers and operators, the classification may be broadly made between the recuperative, horizontal flue-ovens and the regenerative ovens with vertical flues.

Continued on page 10.

*Read before the Society of Engineers of Western Pennsylvania, March 19, 1896.

ADVANCE IN DIRECT CURRENT DYNAMOS.

Builders of dynamo electric machinery have long sought to eliminate armature reaction, the one thing which has been a source of annoyance and expense to the owner by reason of the sparking at the brushes, that is destructive to the commutator. With a practically constant load, the brushes may be so adjusted as to run with little sparking, but in the modern block, for example, with electric elevators to be run, the load is constantly changing, and no engineer can be at all times at the dynamo to adjust the brushes to the proper point as the load changes; hence more or less sparking occurs.

But a radical change has been wrought, and after a long series of experiments, Prof. Harris J. Ryan, of Cornell University, and Milton E. Thompson, E. E., have designed a direct current dynamo which, it is believed, solves the problem.

The cut shown in Fig. 1 has been made from a photograph of a 50 k. w. Thompson-Ryan belted generator, the direct connected type being shown in Fig. 2. The dynamo is of the multipolar type, having from 10 to 18 poles, according to size. The design throughout is a radical departure from well-trodden paths. The principal feature of the machine is a set of "balancing coils," which are wound into a slotted cast steel pole ring. These coils are in series with the armature, and entirely neutralize all magnetic effects due to armature currents and give a field of the requisite strength for sparkless commutation. The field coils proper require only one-fourth the energy usually consumed in ordinary design, and the armature carries from three to four times the depth of copper ordinarily used.

The brush holders connected to brass rings of negative and positive polarity insulated from and fastened to the field casting, project outward and leave the entire outer end of the commutator free and accessible. The only leads employed are from the negative brush holder ring to the negative terminal, and another from the positive brush holder ring to the inner end of the balancing coils. The brush holders themselves are simple, and hold the brushes in such a way that they require no adjustment, but have only to be slipped into the holder. Working with brush holders fixed, there is entire freedom from sparking under all conditions of load.

FIG. 1.

The whole brush holder arrangement is adjustable around the commutator, and by loosening the clamp bolts the brushes may be shifted backward or forward. This is only done, however, for the purpose of adjusting the compounding of the machine. By shifting the brushes in this way, the machines may be adjusted through a range of from 10% drop at full load to 10% rise, without any effect on the commutation.

We quote the results of a test of a 200 k. w. direct connected machine, viz.: One-quarter load, 91%; one-half load, 94%; three-fourths load, 95%; full load, 95%. The high efficiency under light loads, and the great range of uniform efficiency is due to the small fixed losses, the result of the small field energy consumed and the light core losses.

Another feature of this dynamo is the ease with which two or more machines may be worked in parallel, the design of the machine particularly fitting it for this service. They may be thrown in parallel while differing widely in voltage produced, and each machine will take its due proportion of the load, notwithstanding that they may be greatly over-compounded. Two or more machines will work perfectly in parallel, and divide the lightest load evenly, or maintain perfect unison with the entire load thrown off.

The Thompson Ryan dynamo is built in sizes from 25 k. w. capacity to any size desired, both belted and direct connected. The manufacturers, J. H. McEwen Mfg. Co., 18 Dey st., New York, will furnish illustrated catalogues of their engine or dynamo on request.

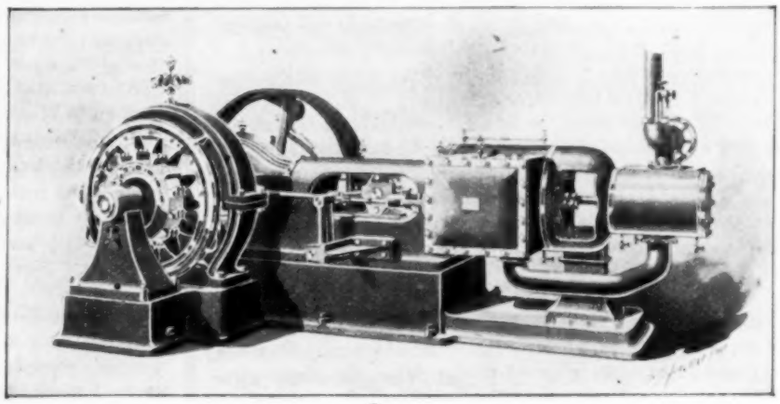


FIG. 2.

Publications Received.

"Statistics of the Trade and Commerce of Buffalo for the Year 1895," is one of the largest of the annual volumes that have been prepared for the Buffalo Merchants' Exchange by Secretary Wm. Thurstone. In its 170 pages are given a digest of the transactions of the Exchange in the year, and a large amount of statistical matter relating to the traffic in and out of Buffalo by lake, rail and canal. The five iron ore docks made a large increase in receipts last year. The railroad facilities of the city are a constant marvel, there being in 42 square miles, 450 miles of tracks; extensions planned will increase this to 660 miles.

We are in receipt of the Cornell University Register for 1895-96, and of a pamphlet containing a paper by Dr. R. H. Thurston, director of Sibley College, on "The Needs and Opportunities of a Great Technical College." In this paper Prof. Thurston points out the splendid field yet to be occupied in this country by schools of the mechanic arts of which we have not a dozen of importance in the United States, while hundreds are scattered over Europe.

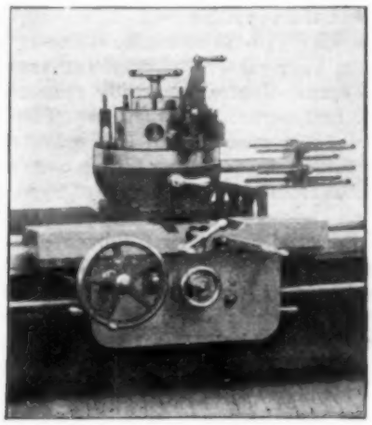
A calendar recently put out by the Berlin Iron Bridge Co., of East Berlin, Conn., bears a lithograph group, in colors, of characteristic views. These include the extensive plant of the company, and about it are arranged illustrations of the bridge work, manufacturing establishments, roof work, and other forms of iron construction which are produced at East Berlin on so large a scale.

PRESIDENT GARLAND, of the Amalgamated Association, has issued the call for the national convention which will open on May 15 at Detroit. The puddlers are agitating the advance of the scale base from $4 to $4.25 to $4.50. There is a sentiment, also, in favor of an earlier response of the wage rate to advances in the market. At present wages for a given 60 days are governed by the average price of iron shipped in the preceding 60 days.

THE Davis & Egan Machine Tool Co., of Cincinnati, has just received from its agent in Brazil one of the largest orders taken in South America. It includes a number of the company's largest tools and amounts to over $10,000. One of the machines will require two freight cars to transport it from Cincinnati to the seaboard.

AN IMPROVED TURRET.

A new style turret is being introduced by the Davis & Egan Machine Tool Co., of Cincinnati. The cuts show the turret with its upper and lower portions separated, and also mounted for use upon the carriage of a 36-inch lathe. Its principal difference from the usual form is an extension at the base, which is provided with a T-slot in which can be placed tool posts of the



TURRET MOUNTED.

ordinary form. In addition to the usual tools held in the turret holes, ordinary forged lathe tools can thus be adjusted in this slot, and as many of them can be used as may be needed. A cut-off rest can also be used on the turret by attachment to this slot, and such a rest is shown at the left of the dismembered turret. Each tool has a separate stop screw and each stop screw can be adjusted separately for its particular tool, doing away with the necessity for adjusting each tool to precise position. For facing cuts, also, a turret and an ordinary post-held tool can be used simultaneously, one for roughing and the other for finishing.

In the case of the turret shown, three-inch stock can be passed through the stem. Ten different sizes are made, and they are used either on lathe carriages or on regular turret slides, and revolve automatically or otherwise. A photograph of samples of work done by this turret without the use of box tools, indicates that its range of work includes all that is usually attempted on turret machines.

AN IMPROVED TURRET, WITH UPPER AND LOWER PORTIONS SEPARATED.

Novel Plan of Relieving a House Shortage.

For some time past there has been a noticeable lack of houses for renting purposes at Chicago Heights, Ill., the well known manufacturing suburb of Chicago. This is due to the fact that the number of manufacturing plants located there has grown rapidly with a correspondingly rapid increase in the population of wage earners. M. H. Kilgallen, general manager of the Chicago Heights Land Association, has finally solved the problem in a very unique way. At Harvey, Ill, only a few miles away, are 50 houses which have been standing vacant for a long time. Arrangements have been made with the owner of these houses to have them transported on freight cars to Chicago Heights and there put upon land belonging to the association, making them available for renting to Chicago Heights employees. The houses are not knock-down cottages, but are substantially built six-room houses, and this method of moving them from one town to another is, to say the least, unusual.

The Harvey Land Association made it a part of the contract with manufacturers locating at Harvey that the latter employ only such workmen as lived within the village limits. This made it a difficult matter for the owners of houses in the outside subdivisions to find tenants, or the people living in those houses to find employment. During the hard times a number of factories suspended operations, and the overbuilt condition of the town became apparent. The development at Chicago Heights began two or three years later than that at Harvey, and as money has been hard to obtain at any time since, the supply of residences has never exceeded and usually has been under the demand. Mr. Kilgallen had the following to say in regard to this: "The last factory people who were located at Chicago Heights simply insist that the supply of houses rentable at from $10 to $15 a month be increased, and the land association will have to meet this demand. It will really be a benefit to Harvey, as it will relieve that place of its overbuilt condition and stop the complaint among insurance men regarding the number of vacant residences there."

A Lehigh Valley Iron Failure.

The Glendon Iron Co., whose furnace plant at Glendon, near Easton, Pa., is one of the oldest iron industries of the Lehigh Valley, made an assignment March 23, to J. Tatnall Lea, of Philadelphia, and Francis C. Gray, of Boston. Mr. Lea is of the well-known pig iron selling firm of J. Tatnall Lea & Co., of Philadelphia, sales agents for the assigned company. The assignment is a general one, made in the interest of all the creditors. Mr. Lea said in general that he did not think the liabilities were great and he believed the creditors would receive dollar for dollar. The assignment was caused by the condition of the iron trade and by the present financial stringency. The real and personal estate of the members of the company will more than cover the claims against it. The capital of the company is $1,000,000 and its investment has been counted worth considerably above that amount. The company was established in 1843, and the original furnaces were blown in in 1844. Anthracite coal and coke were used as fuel. Five stacks were operated a few years ago, but No. 4 was torn down in 1890. The company made a specialty of forge pig iron.

The works are in charge of the assignees and will be operated by them for a time in the interest of the creditors.

IRVING D. BOOTH has been appointed receiver of the Elmira, N. Y., Machine & Foundry Co. The concern succeeded to the business of J. R. Reid, and had built a foundry on the Elmira Industrial grounds. It is thought the business will continue under the receiver.

THE EFFECT OF COKE OVEN CONSTRUCTION ON COKE.

Continued from page 7.

A metallurgical engineer, considering *de novo* the operation of coking coal, would certainly not consider the heat of the regenerative furnace as requisite for the low temperature of the coke oven, which rarely exceeds 1,500° C or 2,800° F. The addition of the regenerative furnace was an afterthought to overcome the loss of heat in penetrating the thick flue walls of firebrick. Its inventor has himself already abandoned it, and now recommends recuperation with horizontal flues. Setting aside its expensive initial cost, its liability to serious injury from careless operation, and its expensive repair charges incurred, it is from a simple engineering standpoint, a needlessly complicated construction. It seeks to accomplish by a high temperature, applied through a very limited area, that which the recuperative furnace accomplishes by a uniform and more moderate temperature through a space ten times as great. The vertical flues of the regenerative construction must do their work in a single ascent and descent through the space of six feet, representing the height of the oven, a total of 12 feet working distance. In the recuperative construction, with horizontal flues, the burning gases traverse three horizontal flues along the side of the oven, each 30 feet long, and return under tha sole of the oven, making a total of 120 feet through which the heat of distillation is applied to the mass of the coking coal. The initial heat in these horizontal flues is not as intense as in the regenerative vertical flues, but as they do their work through a thin tile of only 2¾ in. section, while the vertical flues are 4½ inches thick, it is easy to see that the temperature produced in the interior of the oven is much easier attained by the recuperative construction. The solid masonry construction between and above the Semet-Solvay ovens is itself a recuperator, in addition to the heating of the incoming currents of air adjacent to the chimney flues of the Semet-Solvay oven. Together they form a natural recuperation, of equal effectiveness with the checker work of regenerative furnaces.

It is well known that the Siemens regenerator does not produce a uniform temperature, and that this temperature varies in proportion to the periods of the reversal of the currents. For high temperatures these reversals are frequently made at 15 minute intervals, thus overcoming as far as possible the up-and-down result to the temperature of the working furnace. When these periods are extended, as in the regenerative coke oven practice, to two hours, it is evident that at the times just preceding and just following the reversals, the resulting temperature in the oven must be subject to large variations. On the other hand, the heat conducted to the oven through the horizontal flues by the continuous method is uniform for every section of the furnace. Moreover, this uniform temperature is under very complete control, since by the admission of proper proportions of gas and air to any one of the three flues, the resulting temperature of each individual flue is under control. Any chemist will understand that the heat of fusion and distillation is most effectually applied at the lower part of the retort, and this effect is produced, as seen in the temperatures on the diagram, in the flues of the Semet-Solvay oven.

On the other hand it is equally evident that where burning gases rise through vertical flues, and are then diverted by baffling plates, the temperature is greatest at the baffling point, and it therefore necessarily follows that in the regenerative coke ovens the highest temperature is produced at the top of the flues, the reverse of the proper application of the heat to the purpose required. When through carelessness or wilfulness, the periods of reversal become extended, as every Siemens furnace man knows from his own experience, they occasionally are, the result is a melting of these baffling plates, and enormous injury to the construction. This is the fatal record of more than one retort oven construction. It is such considerations as these that prompted the remark of Mr. Darby, of the Brymbo Steel Works, Wales, that if it is possible to avoid the regenerative construction in coke ovens, enormous trouble and expense will be avoided.

Mr. Fulton states as his conclusion about the comparative working of different retort ovens, that the Semet-Solvay oven is 30% quicker in operation than any of its competitors. As evidence of this, we may point to the 2,000 tons of Connellsville coal for the Buffalo test, coked in 20 hours; to 100 tons of Pocahontas coal, coked in 16 to 18 hours; to 100 tons of Fourth Pool coal, in a recent experiment coked in 20 to 22 hours. From these results we can confidently assert that the Semet-Solvay oven will produce 2,000 tons of coke from Pocahontas coal in one year, or 1,600 tons of Connellsville or or Fourth Pool coke. We have yet to hear of any other oven in America or Europe equalling these records by considerably above 30%.

This rapid operation of the Semet-Solvay oven affects both the original and the operating cost. It will require twice as many ovens making 36 or 48 hour coke as Semet-Solvay ovens making 18 to 24 hour coke. The operating expenses in the Semet-Solvay ovens will also be greatly reduced. These are vital elements in American constructions. The Connellsville coal from the Valley mine sent to Europe in 1893 required 38 hours for coking in the regenerative oven with vertical flues. The coal from the same mine at Syracuse required only 20 hours.

When the direct object of the retort oven is for the production of fuel gas as well as coke, this rapid operation becomes of greatly increased importance. The distillation of the volatile is not through even periods of the time of exposure in the oven, but proceeds with great rapidity during the first half of the time, and very slowly toward the close of the coking operation. It is, therefore, possible, by shortening the coking period, to coke two charges in 24 hours, and produce nearly double the amount of gas and coke, which, for many purposes, will command as high a price as blast furnace coke. In the Semet-Solvay oven, this operation is practicable without any change in construction, but by a simple difference in operation.

In conclusion, we may consider it as fairly demonstrable that, whether for coke or gas, the Semet-Solvay oven is constructed upon correct principles; that it is, both in construction and operation, more economical and rapid than any of its competitors, and that it is available as a working device to the coal miners and blast furnace operators of the Pittsburg and Ohio fields as a profitable investment.

Hardening Tool Steel.

A well known steel man, in speaking of our recent remarks regarding the depth of cut which should be taken from tool steel before attempting to harden it, emphasizes the importance of this precaution, and states that, in his experience, there is no doubt whatever but that this matter is of more importance than any other connected with working tool steel. It is usually considered that overheating is the principal cause of trouble; but this gentleman states that overheating often results from efforts to harden the surface of a piece of steel which will not harden simply because not enough of the outside has been removed to get down to the steel which has not been decarbonized, and which is therefore capable of being hardened.—[American Machinist.

THE April *Lippincott's* has an unusually varied bill of fare. "Penal Administration in Pennsylvania," by Isaac J. Wister, deals with what has been accomplished in prison reform. "The Drama of One Hundred Acres" is a sketch of the development of an Ohio farm. The short stories include "On the War-Path with Kit Carson," by Wm. Thomson; "The Vivisectionist," by Carolyn Wells; and "Dreaming Bob," by Dr. Chas. C. Abbott. "Flotsam," by Owen Hall, is the complete novel, in which the scene shifts from England to India and Australia.

THE Superior Annual, compiled by Jno. M. McCabe, has been issued recently. It contains views of upper lake docks, of industrial plants at the head of the lake, and many pages of statisties and descriptive matter indicating the growth of this port in recent years and its manufacturing and shipping importance.

THE Robert Aitchison Perforated Metal Co. has just closed a contract with John S. Davis' Sons, manufacturers of threshers at Davenport, Ia., for their season's supply of perforated metal.

Repairs have begun at No. 2 Paxton furnace at Harrisburg, blown out a short time ago. It will be made ready for operation if needed.

THE WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, March 18, at the Great Northern Hotel, Chicago. The President, John M. Sweeney, occupied the chair. Those present were the following: John M. Sweeney, A. L. Bowen, Chicago Consolidated Iron & Steel Co., Harvey, Ill.; John Pettigrew, Illinois Steel Co., Joliet, Ill.; J. H. Dalton, Walburn-Swenson Co., Chicago Heights, Ill.; F. M. Lyon, Burlington Route Foundry, Aurora, Ill.; E. E. Hanna, Wm. Ferguson, Gates Iron Works; F. G. Coffeen, H. L. Hotchkiss, J. L. Hecht, Deering Harvester Co.; O. T. Stantial, L. W. Lukens, Illinois Malleable Iron Co.; H. S. Vrooman, Garden City Sand Co.; H. F. Frohman, S. Obermayer Co.; R. C. Barr, Cleveland & Barr; S. T. Johnston, Whiting Foundry Equipment Co.; A. C. Hawes, Emil Axner, Matthew Addy & Co.; J. W. Twomy, American Trading & Storage Co.; Robert Gibbs, A. Sorge, Jr., M. E.; R. F. Palmer, *Industrial World;* B. M. Gardner, *The Iron Trade Review;* Isi Rauh, Excelsior Heater Co.; all of Chicago. E. C. Hinman, Battle Creek Steam Pump Co., Battle Creek, Mich.; A. H. Blackburn, M. E., The Fuel Economizer Co., Matteawan, N. Y.

The Secretary read a letter from the Foundrymen's Association, of Philadelphia, requesting the Western Foundrymen's Association to join them in a call for a National convention of Foundrymen to be held in May.

The Secretary stated that the letter had been before the board of directors and the board recommended to the general meeting the following resolution:

WHEREAS, This association has been requested by the Foundrymen's Association of Philadelphia to join in a call for "the first National Convention of Foundrymen" to be held in Philadelphia May 12, 13, and 14, 1896, therefore be it

Resolved, That in view of the fact that the Western Foundrymen's Association has no control of the arrangements for this National convention, it is the sense of this association that joining in this call should be confined to members of the association only as individuals.

Resolved, That the Western Foundrymen's Association requests its members to attend the convention.

Resolved, That the Secretary be requested to send the names of those individual members who desire to sign the call for the convention to Mr. Evans, Secretary of the Foundrymen's Association of Philadelphia.

On motion, the resolution was adopted.

The Secretary then read the following letter:

"CLEVELAND, O., Feb. 14th, '96.

"S. T. Johnston, Sec'y Western Foundrymen's Association:

"DEAR SIR: It is gratifying to us, and doubtless to yourself as Secretary, and to all officers of the Western Foundrymen's Association, to have the assurance that it has established itself as one of the permanent technical organizations of the country. In view of this fact and of the value of the papers and discussions of your meetings, we have thought your members might like to have some means of preserving the proceedings together, at least for one or two years at a time. We have had prepared, therefore, and have sent to you by express, a number of binders, which we trust will be sufficient to go around among your membership and have some surplus for members whom you expect yet to add to your roll. We trust you will be willing to accept these and distribute them with the compliments of *The Iron Trade Review*.

"Congratulating you on the pronounced success of your administration and wishing the Association a long and useful career, we are,

"Yours very truly,

"THE IRON TRADE REVIEW CO.,

"G. H. Gardner, Prest."

On motion, the Secretary was requested to send a letter of thanks to *The Iron Trade Review* for its courtesy in sending the binders.

Apprenticeship System Discussed.

The president then announced that the discussion of the evening would be upon question No. 4, which reads as follows:

"Is it desirable to have a recognized apprenticeship system, and, if so, what is the best form?"

MARTIN FOX.

The Secretary read a communication from Mr. Martin Fox, President of the Iron Molders' Union, as follows:

"One of the most prolific causes of friction between employers and labor organizations, next to the wage standard is the apprenticeship question; and one of the chief reasons that this does cause friction is the lack of a binding, comprehensive apprenticeship system. It should, I maintain, be the aim of an employer to see that the apprentices under his care become the best mechanics their capabilities will permit. It should be his pride, his boast, that after leaving his establishment they are capable of holding their own as mechanics, and are a credit to the shop in which they served their time. Agreeing, then, that this should be the ruling motive of an employer in his dealings with a boy, we must see the necessity for a definite period of tuition in which his powers may fairly be said to have been developed. It might be urged that some boys are so much brighter than others, that it would be unfair to require from them the same length of servitude that it is necessary to exact from another. But while I admit the superiority of some apprentices, I believe it possible to strike an average suitable to the general necessity. Having done so, we establish on the one hand a period to which the boy will look forward with hope, and on the other an incentive for him to make the most of his period of probation, knowing that after its expiration he must be prepared to assume all the responsibilities of a master mechanic. From long experience and after thoughtful consideration, I would urge the necessity of a specified agreement or indenture, having the force of law, between the employer and the boy's guardian; the former undertaking to give the boy every opportunity to learn the trade and the other guaranteeing fidelity and continuity of service during the time specified. In too many instances the boy is but used to further his master's monetary ends, without regard to his future. So long as he fills the requirements in this respect he is retained and may eventually become a competent mechanic; there are odds against the boy. On the other hand an employer is often taken advantage of by a headstrong wayward boy, who having in his own opinion acquired a proficiency grows restive under some of his fancied disabilities, quits his job, loses to the foundryman the time and trouble devoted to his earlier instruction, and goes out into the world a "botch" mechanic. Under a proper apprenticeship system upheld by both foundryman and the organizations of their mechanics, these evils would be reduced to a minimum, the general welfare of the industrial community improved, and the standard of skill of the American mechanic raised to a point more in keeping with our national preeminence.

These opinions I have presented to you after having endeavored to divest my mind of whatever prejudice may be said to cling to it from the position I hold. I firmly believe that it is only by frank, earnest discussion on occasions such as these inaugurated by the Western Foundrymen's Association, that any permanent and substantial good can be done. We must be willing to receive and weigh carefully each others contention, our first and only object being the general good, laying aside all less worthy motives and laboring for our mutual benefit and improvement we will establish a bond of sympathy between hitherto conflicting interests most advantageous and benign. I therefore tender my most sincere wishes for the success and continuance of the topical discussions feature of of your bi-monthly meetings and thank you for your kindness in inviting me to take part on this occasion."

EUGENE W. SMITH.

A communication was also read, as follows, from Mr. Eugene W Smith, of the Crane Co., Chicago:

"I think it is desirable to have a recognized apprenticeship system. One suggestion I would like to make which I should think would be a desirable feature and possibly a new one. It is a well-known fact that where the boy is apprenticed to the trade, very often the enforcement is not only distasteful to the boy but unprofitable to the employer, thus working an injustice in both cases. Now, to overcome this, I think that no agreement should be made with any boy who has not worked at least one year in the foundry. By this time he will be able

to determine whether he wishes to learn the trade, and his parents or guardian will be able to decide whether it would be profitable to have him continue, and the employer also will know whether he is likely to become a good mechanic. Having decided to enter him to an apprenticeship, the term of service should be at least four years, one of which should be put in the pattern department. He should not only be taught molding properly, but he should also be taught how iron is mixed and melted. Supposing he had started in at 15 years of age, at 20 he will have learned his trade thoroughly, and has had the proper education which should fit him for foundry practice and also place him in line for promotion should occasion require. As it is at present, the training school is the only source of supply for future foundry foremen."

JOHN GOTHAM.

The following letter was read from Mr. John Gotham, of the Kelley Foundry & Machine Co., Goshen, Ind.:

"I think that a recognized system of apprenticeship would be very desirable, provided the system could be made general, and even if not general, it would be a good thing for the boys. My idea of a system would be to apprentice a boy for four years, divided as follows: The first year to be spent in the core room. The second year give him no regular work, but use him for all purposes around the foundry, more particularly about the cupola. Let him become familiar with machinery about the foundry. The third year give him a floor on easy work, and the fourth year give him the best work in the shop. During his second year I would allow him to do some molding, and help molders on large pieces. With such a system I think you could turn out a better molder than the average man with 10 years' experience, and I think it would be beneficial to the employer as well as the apprentice."

CLEMENT BUSH.

Mr. Clement Bush, of Quincy, Ill, wrote as follows:

"In my opinion a recognized apprenticeship system in this country is badly needed. In the first place, I would have an apprentice serve from five to six years, viz.: Six months at cupola, one year at core-bench, 3½ to 4½ years at molding. I would also have the employer teach the boy the trade as much as lay in his power. I am also in favor of reducing apprentice's wages, so that the employer can be paid for his trouble in teaching the boy the trade. In my 45 years of experience, I find that I cannot change men from one job to another for lack of experience."

THOMAS D. WEST.

The following communication was read from Mr. Thos. D. West, Sharpsville, Pa.:

"The writer would say 'Yes,' and for one form presents the following plan for discussion: First divide our trade into three branches: machinery, stove plate and bench molding. For heavy work shops that do loam molding in connection with green sand, have the term of apprenticeship five years. For all strictly heavy and jobbing green sand shops, four years. For shops doing light machinery, three years. For bench molding specialty shops, two years.

"In starting a boy, give him a trial of six months, and if he is found not to possess mechanical ability, let him go; otherwise, at the end of this period, 'bind' him to finish his 'time,' and on completion of the term have the proprietor sign an apprenticeship certificate certifying that he has faithfully served all his 'time,' specifying an actual number of days, which will be understood as meaning that if a boy lost any time through sickness or otherwise, he has made it up before the certificate is tendered him.

"Before permanently 'binding' a boy to an apprenticeship, have him furnish three advisers or backers: one skilled tradesman, in or out of the shop, one business man, having a reputation for intelligence and integrity, and a family physician or another business man, to sign the article of agreement furnished by the proprietor, something after the following form:

'We, the undersigned, hereby agree to endeavor to arbitrate all grievances, whether for the employer or apprentice, and use all just influence to have right prevail on both sides, and if satisfied by facts that justice is not being accorded the apprentice, he can then be released from all obligations of his contract by any two of his backers signing the blank release attached to the main contract, for that purpose. After such an act on the part of two advisers, the boy is then at liberty to engage with any other founder should he desire to do so, in order to finish his "time." It being understood that six months is to be added to the total time first called for in the original contract on account of each change, in order to permit the boy time to make up the progress lost by the change in getting the run of a new shop, its work and men.'

"I would grant the employer the full right to discharge an apprentice at any moment, should he, for any reason, feel justified in doing so. I am well aware there are those who would argue that an employer should be bound the same as the apprentice in requiring two signatures of the boy's backers, before the employer should have the power to discharge an apprentice. To have such conditions prevail would annul the very object desired to be attained, which is the bringing of every possible factor to bear in influencing the apprentice to labor earnestly to learn the trade. What control could a proprietor or foreman have over an apprentice, if the latter knew he could not be discharged without the consent of his advisers? I think all will agree that employers are generally desirous of retaining an apprentice as long as they can, especially so when he becomes proficient in getting out good work. Such conditions are very effective in favor of the apprentice and restrain the employer from hastily using his authority in discharging.

"The three backers stand between the apprentice and the employer to release the boy from his contract, should they, at any time, find the employer is not affording the boy opportunities to thoroughly learn his trade, in the best manner that the shop's work will permit, or in any wise not treating him fair and just. And then again, should the employer find the boy in error, and that he will not follow instructions which he thinks to the boy's interest or his own, he can then counsel with one of the advisers, who, in turn, can have an interview with the boy, and if necessary call in the aid of the other two advisers, to use their influence to have the boy do what they think right. But upon investigation, should it be found that the employer is unreasonable in his desires and can not be prevailed upon to do what they think just, the above provisions then permit their releasing the boy from his contract with the employer and give him freedom to engage with any other firm.

"There are two elements upon which the employer and advisers could seriously disagree. The first is wages and the second the amount of work. The first could readily be agreed to in the contract, but the second, we must admit, would in many cases be a question occasionally requiring adjustment. But if the advisers will remember that it is to the boy's own welfare to learn to give quantity with quality, and if the employer will be reasonable in his demands in managing the apprentice, so as to retain a boy to the end of his contract, there should not be any great difficulty in satisfactorily adjusting any disputes on this point.

"We must all recognize the necessity of discipline in bringing up youth, in order to create, not only good mechanics, but citizens. Compulsory education in our schools is recognized as necessary to the general welfare and correct training of the child, and all intelligent parents support teachers in properly training and educating the youth. Are there any that can give good reasons for similar influences not being brought to bear on the boy in learning a trade? When we come to seriously consider the two fields, the school is but primary to the shop; and, if anything, a tradesman is more important than a learned scholar, as the extent of his progress in the trade is what will grade his wages and ability as a journeyman who will be sought after in the calling he has chosen to give up his life's service to.

"If there are any to object to the plans advanced by this paper it should mainly be the employer, for the burden of such a method falls chiefly on his shoulders. Nevertheless, I believe most employers stand ready to do almost anything to secure conditions which would admit of making all apprentices good, skilled mechanics. Some will say they do not perceive where such a system would place any burden on the employer, as he stands to day largely independent in regard to the treatment of apprentices, as no one takes any interest in them nor is there any special provision made for their general welfare and future success. The employer is now free to use his own judgment in advancing the apprentice, as regards perfecting him in all the branches of his business, whereas, were there

such a plan in vogue as this paper advocates, the employer would, in a sense, did he not 'give the boy a show,' have three overseers to consult with for every apprentice he might employ, so that employers having 30 apprentices would have 90 sub-bosses, who would be running to them at any time the apprentice might think his sensibilities touched in the least. This is the radical way to put it; but the common sense way, which could be easily followed, is for the apprentice to treat with his employer as far as he is able to do so himself, and only as a last resort to call in the assistance of his backers, and then only in rare cases would it be essential for more than one adviser to confer with the employer, as he could generally well voice the opinion and desires of the other two. The knowledge that there were those who would be after an employer did he not do right, would be an element to cause him to travel pretty straight in his rulings and if the boy used half reason there should be very little or no trouble.

"It is natural for a boy to think that when he can become sufficiently competent to do good work as well as he may see some 'would-be molders' turning it out, he is thoroughly qualified to start out as a journeyman. As many think it is not to the interest of the would-be mechanics to have skill created which can surpass them, it is evident they are not going to advise or assist an apprentice to achieve greater skill than they possess, nor are the few truly high-skilled workmen overly anxious to aid them. It is this influence in conjunction with haste of the boy to be receiving man's wages that tend to his not being content to give the 'time' he should in order to become a thoroughly skilled mechanic.

"All good citizens should labor to change the present conditions so detrimental to the welfare of the poor sons of the mechanics or laborers who are generally desirous and ambitious to make themselves valuable skilled men, and generally would do so, were they not misjudged by false representations, bad examples and distrust which prevails among many men, whom the boy is thrown in contact with when considering the question of learning a trade. With a board of disinterested, industrious, intelligent men to advise and influence a boy, also to see that he is permitted every chance to thoroughly learn to do a shop's work, I fail to perceive why the boy should not then be placed in a position to discover the sophistries so detrimental to his own interest while he works under the advise of his backers steadily for any length of time necessary to make him a thorough, skilled artisan, should he have the ability to become such.

"Thirty to 70 years back, the boy had little need of influence to direct him to finish his trade. In some cases he had to do so or go to jail; he was not given the freedom which the boy of to-day enjoys, nor was he in a position to feel any sacrifice of the independence so bred in our American youth, caused by improvement in labor's social system, which in its advancement has lost all sight of the trade apprentice. We find everything favorable to thoroughly train the professional man. Nothing has been omitted in that line and the most rapid improvement in studies and method to discipline and train the student are being daily enacted to aid him achieve success in the higher mechanics, while with our practical artisans we find the reverse more true and labor largely is its own worst enemy.

"The turn of events creating a demand for skilled labor should be the means of awakening popular study to the neglect of the past and the great need of resorting to some remedy to restore us to a condition which can exist and support a system for creating a larger number of skilled mechanics. We can not return to the old laws and usages of training the true mechanic. The advancement of the age calls for an entirely different plan to create high skilled labor and while we may be able, on account of our advancement in knowledge of the principle and science of the arts and industries educate in less time than in the past, we can not ignore the fact that to create skill requires more time than is at the present day expended.

"We cannot now imprison our boys if they will not serve sufficient time to become thorough artisans, but we can create customs to meet the changed conditions of the day and greatly improve the fields that are open for development to benefit labor. This can be done largely by aiding in producing a greater degree of skill in the workman so as to enable him to better give an equivalent by which to exact higher wages, and by increasing the number of skilled artisans, better supply the requirements of to-day."

WILLIAM FERGUSON.

The following contribution was read by Mr. Ferguson:

"In order to perpetuate any business, it becomes necessary to school the succeeding generations. This applied to the foundry means we must have a thoroughly practical apprenticeship system if the molders of the future are going to be superior mechanics to those of the past, and necessarily they must be in order to meet the demands that will be placed upon them. As there is no place quite so good to make molders in as the foundry, I fail to see how it can be otherwise than desirable to have a recognized apprenticeship system. Some may argue that the result can be accomplished by specializing, but foundry work is of such a growing and diversified nature that it is not practical to follow this system on special lines alone. In the majority of foundries there is not enough special work for any given length of time to make it possible to keep one man on any one piece, or even pieces of a similar character. This is true even in foundries making specialties in conneccion with general work.

"Under such conditions it becomes necessary to have what we term general or all-around molders; that is, molders who have been schooled in the various branches of the business to such an extent as to enable them to produce a good casting from any pattern given them, and often without patterns, without having to serve their apprenticeship on each special piece at journeyman's pay before they succeed in making a good casting, as is too often the case at present. Then again, if we do not make molders for present or future use, how can we expect to continue the business? Some will say, we have got along fairly well so far and there has been no apparent scarcity; but is it not true that we have been supplied by molders who have served an apprenticeship in foreign lands, where they have a thorough system and mostly by indenture? It is safe to say that two-thirds of the best molders working in America to-day are of foreign make. This, to my mind, is an instance of too much free trade and a lack of proper protection in this line.

"The common way of making molders in this country consists in engaging a young man for that special purpose, and then turning him loose and allowing him to catch on as best he can, with the result that, at the end of three or four years, he is turned loose on the community without knowing even the common rudiments of the trade. Another way is to put a laborer to make some special piece and keep him at it until he becomes expert, if you will, and if this job runs out he will possibly be tried on some other pieces, and after a few such changes the man imagines he is a molder and can get more money working elsewhere and he starts out looking for a position. He gets a job in course of time, and as soon as he makes a start the foreman knows, from past experience, that this fellow is not much of a molder, but being willing to give the new man a little chance to become familiar with the shop and tools he lets him alone, the result being that this man gets a few days' experience (the thing he is after) and the boss gets grief and scrap. And so this fellow goes from place to place until he finally has picked up enough knowledge of the business to enable him to hold a position, receive going wages and call himself a molder. But this is not making mechanics legitimately.

"The system I would advise in the making of molders or foundrymen, would consist of a contract for a term of four years under good, rigid discipline, at stipulated wages for each separate year, with certain requirements to be accomplished in each year before the apprentice would be entitled to advancement. I would advise a premium for those filling the requirements before the stipulated time. A small retainer from each week's pay as a guarantee of good faith is advisable. This contract should not only state the requirements to make the apprentice a mechanic, but it should contain some clause looking to his deportment and moral conduct, and certain requirements should be called for from all applicants, such as age, education, general health, physical ability, etc. This having been attended to and the applicant accepted, it should then be the duty of the firm to give him all the opportunity possible to make him the desirable man and mechanic they would be pleased to have in their works; and it being a mu-

tual interest and both parties schooled to work with that end in view, it surely must follow that a superior class of mechanics will be the result, and self-interest with the manufacturer must soon make the adoption of some practical apprenticeship system a necessity."

General Discussion.

Mr. Sweeney: There are two things that have occurred to me as Mr. Ferguson was reading in regard to an apprenticeship system. I think it is a good thing, in arranging an apprenticeship system, and in arranging the wages that are to be paid, to leave the last year's wages of the term undecided, with the understanding that the last year's wages will be based on the value of the work. That makes an incentive for one apprentice to excel another. I have often been amused in having boys who applied to be taken as apprentices try to tell me how many inches there are in a foot. If they can do that, they generally fail to pass in the sub-division of the inch. It is a very hard matter with some of them to get the decimal idea into their heads. That portion of Mr. Ferguson's paper which refers to some preparation is good.

Mr. Pettigrew: For a good many years past it has been our system in Joliet to bind the apprentices. It used to be the system to bind them for four years. The apprentices that were bound for four years thought that they were imposed upon, and the consequence is that the apprentices in the molding shop are only put under a three year's binding. The first year they were paid 50 cents a day; the second year, 75 cents a day; the third year advanced to $1 a day, and the fourth year $1.25 a day. When the fourth year was up, if the boys had fulfilled their contracts and the foreman thought it advisable, they got $100 premium. In the machine shop they were paid the $100 premium at the end of the third year, and that caused a good deal of feeling. Since that was introduced it has been my custom to rate all of the boys as near as I could on that basis; but I like to take the apprentices on as helpers for a limited length of time until I can see what they are worth; then I put them on the apprenticeship system. I find that it works exceedingly well. The apprentice can find out whether he is willing to go on and learn the trade of molding or whether he thinks it would be too hard work and wants to drop out. During that period, part of the time I put them on as helpers for some of the core-makers, the other part of the time I put them into cupola work, so that I can fall back, if necessary, on having a competent cupola man. I might say that out of some 35 or 37 molders trained since 1875, I have three-fourths of my apprentices as mechanics. They are men I can put on any kind of a job I want to get out and depend on getting it. I can depend a good deal more on geting the work sure and good, than I can with old-country molders that have spent seven years as apprentices. I have some now who have only been about three years at the business and they would class against first class traveling molders —tramps, as I would call them. I think the way of binding molders, something the way Mr. West recommends, is a good thing. We have got to depend on the men we get in country towns. Last year I took a trip to the East and in visiting in Youngstown I visited a foundry concern. They had a great complaint to make about the class of molders they had to employ. I made the suggestion that they raise the boys in their own town to do the work. It seems that had never been thought of. Why not raise up our boys to this business?

Mr. Sweeney: In making an agreement, have you had any security that the apprentice would stay his time out?

Mr. Pettigrew: Only the $100 at the end.

Mr. Sorge: I would like to ask Mr. Pettigrew how many apprentices he has trained in that time?

Mr. Pettigrew: I have trained over 60. Some of them have made good men. Since the $100 premium has been in force we have not had one desert us.

Mr. Sorge: I think it is certainly a very desirable thing if we can obtain an apprenticeship system which shall be universally recognized and in which each manufacturer shall be equally interested. The only difficulty that I can see is that the selfish manufacturer will allow the unselfish and generous one to have all the trouble of educating the apprentice and then take the profit and advantage of this education. If you train up a set of young men in the proper way the valuable portion of their services comes after their training, and we can only obtain the benefit of the service by keeping them with us. Mr. Pettigrew has trained about twice as many men as he has retained. I think the conditions at Mr. Pettigrew's shop are better than they are in Chicago. In a small place like Joliet the boys stay in the shop a greater length of time than in a large city. I think in Chicago there would be considerably more shifting of these young men after they have served their time. It would be a most desirable thing, but I fear in getting up such a system—although it would be an ideal one —that the selfish manufacturer, whose sole and only aim is to get the greatest amount of labor for the smallest amount of pay, would get all the advantages.

Mr. Pettigrew: I would like to go back to my own apprenticeship. When I served my time in the old country no man could work in any part of Scotland without having served seven years as an apprentice. He had to work that seven years to get his proper papers from the firm that he worked with. As far as I knew, all the foundries in the old country up to the time I left it—30 years ago—had no trouble with their molders. If they did not become good mechanics the union would not keep them and the firms would dismiss them just the moment they did not do their work properly. One bad casting might be excused but the second one would not.

Mr. Sweeney: I would like to ask Mr. Pettigrew to how many of the men who finished their apprenticeship did he pay the $100.

Mr. Pettigrew: Every apprentice but one within that time.

Mr. Sweeney: Was there any difference between them?

Mr. Pettigrew: Yes.

Mr. Sweeney: Then some would be entitled to more than the $100?

Mr. Pettigrew: Unquestionably, I would give some a good deal more than the $100.

Mr. Sorge: How many of those that were trained in the last seven years and are still with you received the $100?

Mr. Pettigrew: About five. I have got something like 26 of my own apprentices now that I would not exchange for any men.

Mr. Sweeney: How many have you that served their time in other shops?

Mr. Pettigrew: I have some from the old country, excellent mechanics that served their time there.

Mr. Sweeney: What I want to get at is this: Mr. Sorge's objection to the apprenticeship system of this time is that it will not be equitable, because all shops will not take boys. I have an idea that this to an extent will take care of itself. An apprentice out of his time at Joliet may go to Mr. Ferguson, but it is quite as likely that an apprentice out of his time with Mr. Ferguson goes to Joliet.

Mr. Pettigrew: I have had a good many boys leave me when they were two or three years at the business because they got a pretty good show and were pretty good mechanics and they found out that they could come to Chicago—this was several years ago—and get more money than they were getting down at Joliet. They came here and got journeymen's wages in several of the shops. According to what Mr. Sorge says that is a great drawback. You have firms here that will hire these men without any asking at all. If they suit them they will do the work and get the pay. I have had boys leave me and go to the Rock Island shops when I was paying them 75 cents and $1 a day and get there $2.50 a day. As many, I should judge, have done that as fifteen. That was before we had the $100 inducement.

Mr. Vrooman: I served an apprenticeship, and I had to furnish bonds that I would serve my time. Mine was piece work and the first year I got 60 cents on the dollar, the second 70, and so on. After the third year I was considered a mechanic and got full wages. I do not see how any rule could be laid down whereby all apprentices could be governed alike. The first instructions I got I never forgot. A couple of pieces were brought and laid down before me, and I was told to make two like them. It is a question of money with an employer. He cannot afford to pay a man on a job that he has contracted to do at a certain price unless he is going to get something out of it.

Mr. Hanna: I have schooled but few apprentices, but I want to say this for the apprentices, that I do not remember any that served their complete time that I did not make money on during the time of their apprenticeship. I do not

see why an employer should pay an apprentice during his apprenticeship as much as he earns. I do not see why the apprenticeship system should not be a paying thing to the employer as well as a profitable arrangement for the apprentice. It is with me simply a question of whether I have the room and the chance to properly instruct more or less apprentices. Another thing that I believe should be looked after, and which has not been touched on to night, is that most of the American boys have had a free school education and are not wil ing to serve an apprenticeship. They want to do something a little cleaner. We must get our apprentices from a class of boys that have not had the advantages of an education. I think it is a great deal more to the advantage of the employer to fit his apprentices to fill any posts that he has around his place; in other words, to give him during his apprenticeship help in educational lines as well as in manual dexterity. If the concern is large enough to do so, I believe they should have a night school during certain parts of the year. I believe in apprentices and the apprenticeship system, and I believe there should be an agreement between employer and apprentice, because I think it is simply a good business proposition for every employer to have his apprentices.

Mr. Ferguson: The only thing I see in favor of the organized apprenticeship system is an agreement as to the term of years and wages paid for the services, so that there shall be no dissension on these lines. I know that I have had a good deal of trouble with boys that I have started in to make molders out of, at small wages, because there are other shops that will pay a dollar a day.

Mr. Sorge: Mr. Hanna states that he would put in apprentices if he had the room, place and opportunity to train them. I should judge from that remark that, if Mr. Hanna was crowded with work so that his room was limited, he would think it more profitable to put journeymen in the place occupied by apprentices. Suppose you are crowded with work, is it more profitable to have apprentices or journeymen?

Mr. Hanna: I could not say whether it would be more profitable, but certainly if I were very crowded I should prefer to work journeymen.

Mr. Ferguson: I do not think we have anything to fear from what Mr. Sorge spoke of—the selfish manufacturers getting the benefit of apprentices trained in other shops. Allowing tha the good mechanic leaves the place where he has served his apprenticeship, he is going to be a good mechanic whether the other fellow gets him or not. It should not be in the light of a charitable act of the employer to school and educate an apprentice to become a mechanic. I think it is a business proposition and a necessary part of the foundry, just as much as to have power to run the place.

Mr. Sorge: I would like to have Mr. Vrooman tell us his experience in working by the piece and whether he was not making journeyman's wages and turning out worse work.

Mr. Vrooman: I will say that where the piece work system is employed the apprentice learns to be a hog more than he does a mechanic. While I was there I saw that the piece work system was not the proper one by which a mechanic should learn his trade. I also saw the system changed and apprentices put in by the day. Of course a man can be bound as I was. Had I left before my time expired my bondsmen would have had to pay the damages. I do not believe in putting an apprentice on piece work until he has at least served three years of his time.

Mr. Pettigrew: If I were a very selfish employer, most undoubtedly I would never have an apprentice at all. I would look to my own best interests and see that I had nothing but the very best workmen. That might work well enough for a little time, but where would I be in the future, having to depend upon fellows that come from such shops as Mr. Vrooman speaks of?

Mr. Stantial: I have had no experience with apprentices in the foundry, but in our pattern and machine shops we have a system that works very well. We take the boys first for a few weeks to see what they have in them, and if they are adapted to the pattern department or machine shop, then we make a contract with them for three years, so much for the first three months and advance them each three months until the end of the third year, when they are getting $8 per week. The salary for the first month of each year is held back but if they stay their full term of three years, the money that has been held back is paid to them in a lump sum. It amounts usually to something between $50 and $60. I do not remember any apprentices quitting or breaking their contracts in the last four years under this system.

Mr. Hanna: I of course believe in a binding contract with some monetary consideration to induce the parties to serve their full term. There might be a bonus, as Mr. Pettigrew gives, or holding back part of the agreed wages. There should be something that will be an inducement to keep the boys from leaving and going to another shop where they can get $1 a day, as Mr. Ferguson suggests. There should be a contract and something to make it binding. Now, as to a man leaving at the end of his apprenticeship, I cannot find any fault with that. The best men I have had anything to do with have been tramps, as Mr. Pettigrew calls them. I might say I have been a tramp myself, having worked in 30 different States. I do not mean the whisky-soaked tramp, but the man that is going over the country and catching on to new ideas and is willing to use those ideas for the advantage of his employer. He will be a mechanic. It is part of his education. In all probability, when he is ready to settle down, he is just as likely to go back to the first shop that he worked in as to go to some strange shop.

Mr. Dalton: I believe in the apprenticeship system, and think it is the only successful way to make a good molder. Of course, much depends on the kind of shop the boy serves his time in and the instructions he receives, and also the inclination of the boy to have an interest in his work. There are a great many boys that are forced into foundries that do not like the work. I do not believe in keeping boys of that kind. Take boys that have served their time in car shops and agricultural shops, and when they have served an apprenticeship of four years they are not capable of working in a jobbing shop.

Mr. Ferguson: I think this subject has been pretty well discussed to-night, but I am not satisfied to drop it here. I move that a committee of three be appointed to draw up a set of indentures, and to submit them to this association at some future meeting.

Mr. Sorge: I would like to offer an amendment, that the committee be instructed to draw up a plan for an apprenticeship system, including a set of indentures.

The motion as amended was carried The chair announced that the committee would be named later.

Mr. Sorge: I would like to suggest that the Secretary be called upon to request all the members of the association and all foundrymen to give any information on the subject that may be obtainable, so as to give the committee all the material possible.

The Secretary announced that at the meeting of the board it was decided to hold the next out-of-town meeting, similar to that held in Milwaukee last fall, in Cleveland. Probably it will be in the month of September.

A CHICAGO paper in its financial column, has been arguing with some persistence, for freer trading on the local exchange in the stock of the Consolidated Steel & Wire Co. The following statement concerning the company is made in this connection: "It can be stated on the best authority that the company is now earning at the rate of 2½ per cent per month on its capital stock of $4,000,000 or 30 per cent for the year. On equally good authority it can be announced that the earnings for 1895 were 27½ per cent, or over $1,100,000. The Consolidated Steel & Wire Company has an annual output of about 288,000 tons of rods, 482,000 tons of plain wire, 160,000 tons of barb wire, and about 3,000,000 kegs of wire nails. As an allied branch of the steel industry, the fact that this company is doing such an excellent business in 1896 must be taken as an encouraging feature of the general situation. The company does about 65 per cent of the barbed wire business of the United States and 45 per cent of the wire nail business, while it does over three-fourths of the export business in barbed wire. The company has factories at Joliet and Lockport, Ill.; Allentown, Beaver Falls and Braddock, Pa., and Cleveland, O. It has paid 10 per cent dividends since its organization in 1892."

PECULIAR CHARCOAL FURNACE PHENOMENON.

BY J. T. DONALD.

In October last the Canada Iron Furnace Co., of Radnor Forges, Que., sent the writer a sample of what they termed partly consumed charcoal containing a large percentage of silicious matter, and which they stated "had been thrown out at the cinder notch of the furnace in large quantities unconsumed, and showing fibers or threads of a yellow color and similar to mineral wool." It was further stated that "the coal which was made from oak and apparently basswood and elm seems unfit for use in furnace work." A very superficial examination was sufficient to show that this charcoal was very peculiar indeed. Its unusual weight at once challenged attention, and a closer inspection showed in the specimen a framework in the form of a fibrous mass not unlike a piece of harsh-fibred asbestos. Analysis showed that this fibrous matter amounted to no less than 41.16% of the coal.

The question now was to account for this large percentage of mineral matter. The only explanation I could offer was to suggest that it might be the result of charring wood that had been partially fossilized, for it is well known that such silicified wood is not uncommon. At the same time this suggestion did not satisfy me. It did not, I thought, cover the fibrous or rod-like structure of the mineral matter, for I had never seen a similar structure in silicified wood.

I therefore decided to send portions of my sample to Prof. Penhallow, of McGill, and Mr. W. F. Ferrier, of the Canadian Geological Survey. These gentlemen are authorities in their own departments, the former as a botanist and the latter as a mineralogist and lithologist, and it appeared to me that the question of the origin of the siliceous matter of this coal was one of botany or mineralogy and not of chemistry.

Prof. Penhallow, having examined the specimens, reported that "it seems difficult to think that these rods are the result of natural processes of growth." Mr. Ferrier said he thought the siliceous matter had not been present in the original charcoal, but that it was slag that the coal had absorbed in the furnace. Then, next, word came from the furnace at Radnor that similar fibrous charcoal had again been ejected from the slag notch and this while charcoal from a totally different locality was being used in the furnace.

The evidence was thus strongly against the view that the siliceous matter was part of the original coal and in favor of Mr. Ferrier's suggestion. The question was thus again, as it were, thrown back into the sphere of chemistry and it appeared probable that an analysis of the fibrous matter would settle it. After much care and labor a quantity of fiber, sufficient for analysis and free from the ash naturally present in the charcoal was obtained.

The difficulty in securing a satisfactory sample lay in the fact that the alkali of the true ash caused the fibres to fuse, forming little glassy globules. It was desirable to avoid these in order that the analysis might show the composition of the fibre itself. The analysis of the fibre is stated in column 2. Column 1 is the partial analysis of a sample of Radnor slag made by me in January, 1891.

Alumina	13.52 per cent.	18.15 per cent.
Ferrous Oxide	1.44 "	.51 "
Manganous Oxide	3.48 "	Traces.
Lime	22.89 "	35.44 per cent.
Magnesia	.74 "	1.47 "
Sulphuric Anhydride	1.52 "	Traces.
Silica	54.00 "	42.18 per cent.
Alkalis, phosphoric anhydride, etc. by diff.	2.41 "	2.25 "

It is thus very evident that the fibrous matter of this charcoal is simply absorbed slag. Two questions of interest then arise. They are, first, what were the conditions in the furnace that caused charcoal in large quantities to absorb and retain the liquid slag? and, second, how does it happen that only on two occasions has the production of this slag-saturated coal been observed?

The following particulars regarding the furnace are data that must be taken into consideration in any theory put forth to explain the very peculiar behavior of the charcoal under consideration: Four 3½ tuyeres are used. The average pressure of blast is about 5¾ lbs.; the average temperature of blast, 900° F. The quantity of air, as a rule, is 2,638 cu. ft., but at times it has run to as high as 2,827 cu. ft. to the minute; cubical contents of furnace from stack-line down is 1,264 cu. ft.—[Engineering and Mining Journal.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

Chas. P. Parish & Co., Chicago Heights, Ill., want to buy a drawing press, similar to Bliss No. 3 or 30.

J. Bradsh, 1089 Milwaukee ave., Chicago, wants to buy a second-hand bench lathe, with attachments.

Warren Springer, 207 S. Canal st., Chicago, wants to buy a second-hand boiler punch, hand power preferred.

Withington & Cooley Mfg. Co., Jackson, Mich., wants to buy a second-hand 36x36x8 ft. or 10 ft. planer of first-class make.

The Modern Cycle Co. has been incorporated at Chicago with a capital stock of $5,000, to manufacture bicycles, by Walpole Wood, Fred A. Bangs and Fred. E. Goff.

The Joliet Bridge & Iron Co. has been incorporated at Joliet, Ill., to build bridges, with a capital stock of $10,000, by Robert C. Morrison, S. P. Avery and John Heatherwick.

The Cohoes (N. Y.) Valve Mfg. Co., comprising Frank L. Horrobin, George Vincent, Edgar Van Sanford and Morris Van Sanford, will manufacture an improved straightway valve.

Among late incorporations is the Terrell Gas Machine Co., of New York; capital $200,000. Directors: Oakes Terrell, E. P. Gleason, of Brooklyn, and James P. Wilson, of Newark, N. J.

The Chicago Handle-Bar Co. has been incorporated at Chicago, with a capital stock of $25,000, to manufacture bicycles, by George W. Webster, Thomas W. Prindiville and Edward J. Walsh.

The Spaulding Machine Screw Co., of Buffalo, N. Y., has been incorporated, with a capital of $300,000, by Hudson Hoagland and Thomas H. Spaulding, of New York City, W. H. Crosby, of Buffalo, G. W. M. Reed, of Hartford, Conn., and C. A. Pugsley, of Peekskill, N. Y.

The Washington Steel & Tin Plate Co., Washington, Pa., has been granted a charter, with a capital stock of $100,000. The incorporators are: John Scott, R. M. Vincent, Wm. H. Griffiths and John A. Scott, Pittsburg, and T. A. Griffiths, Washington. Work on the plant has been going on for some time.

The Brown Mfg. Co. has been organized at Beaver Falls, Pa., with a capital stock of $50,000. It will engage in the manufacture of bicycle tubing, and has leased the building formerly occupied by the Midgley Wire Belt Co. at that place. Among the stockholders are: E. L. Hutchinson, J. F. Kurtz, M. A. Perrott, R. S. Bailey, of Beaver Falls, and W. C. Brown, of Chicago.

A new Hamilton, O., corporation is the Hamilton Tube Co. The incorporators are George W. Peters, J. C Hooven, George A. Rentschler, C. E. Hooven and Dr. E. S. Griffis. The main product will be bicycle tubes. The company has chosen as president, C. E. Hooven; vice-president, George A. Rentschler; secretary and treasurer, J. C. Hooven; general superintendent, George W. Peters.

The American Mfg. Co. has been incorporated at Canton, O., with $25,000 capital stock, to manufacture Smith's patent nested stove-pipe, heater-pipe, elbows and drip-pans. The company is now operating at Minerva, O., and will remain there until its stock is worked up. At Canton it has purchased the Poorman plant, the main building being of brick and 50 x 325 feet. There is also a 75-h. p. Buckeye engine and necessary shafting. The president of the company is W. W. Irwin, and M. F. Taylor is secretary and treasurer. Both are connected with the Canton Rolling Mill Co. F. J. Ruth, of Alliance, is vice-president, and C. A. Smith, of Minerva, general manager. R. C. Ruth, of Alliance, is a director, and C. C. Patterson, of Cleveland, is a member of the new company.

Fires and Accidents:—

The Kemble Coal & Iron Co., of Riddlesburgh, Pa., has been damaged about $20,000 worth by fire.

The works of the Housatonic Brass Co., Wallingford Conn., burned, with considerable loss. The insurance is $62,000.

The plant of Kroeschell Bros., Chicago, makers of boilers, heaters and steam fitting appliances, was damaged to the extent of $10,000 by fire, March 22.

An accident at the Bridgeport works of the Illinois Steel

MATERIAL.

THE COCHRANE HEATERS.

Why do we build the Cochrane Heaters of Cast iron? Did you ever examine, or have occasion to replace a piece of wrt. iron pipe or a wrt. iron shell which had "rusted out"? Did you notice that there were little hollows here and there—a general "thinning" of the metal? Corrosion had eaten away parts of the structure. Anything made of wrt. iron or of steel will deteriorate rapidly from the same cause—Boilers as well as Feed-Water Heaters. The acids found in feed-waters lose no time—they busy themselves attacking the interior of these shells—pitting and corrosion go on—and it is only a matter of time before trouble occurs—repairs must be made—a new heater purchased.

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HARRISON SAFETY BOILER WORKS,

MANUFACTURERS. PHILADELPHIA, PA.

Co., at Chicago last weeek, injured five men, two of them so seriously as to cause death later. The men were burned by molten metal overflowing from a ladle.

The building owned by the Brown Bros. Mfg. Co., at 71 W. Jackson st., Chicago, was damaged to the extent of $1.300 by fire on March 22. The plant of the Standard Cycle Co. in this building was partially burned, with a loss of $500.

At the Shenango Valley Steel Co.'s mill, New Castle, Pa., the crank shaft of the blooming mill engine broke, last week, and the mill was shut down. If a new shaft can be had at once the delay will not be more than two or three weeks; if the shaft must be forged the shut-down will be longer.

At Joliet, Ill., the plant of the Consolidated Steel & Wire Co. was gutted by fire March 23, involving a loss of $100,000, and throwing 350 men out of employment. The fire originated in a hotbox in the shafting near the roof in the rear part of the barb wire fence department, in which there are 250 fence machines. One of the warehouses, where considerable stock was stored, was saved, the other one was badly damaged. The company's office and books were saved. The works were running night and day. This is the Lambert & Bishop plant which burned some years ago and was rebuilt. There are three other mills—at Lockport, Ill., Beaver Falls, Pa., and Cleveland. Mr. Lambert cannot say whether the company will rebuild or not.

Additions, Enlargements, Removals, Etc.:—

Heller & Bros., Newark, N. J., are enlarging their tool plant.

The Harrison Safety Boiler Co., Philadelphia, will build an addition to its works.

The Union Mfg. Co., New Britain, Conn., will build a two-story extension to their works.

The American Wringer Co., Woonsocket, R. I., will build an addition, 257 x 60 feet, three stories.

The Falcon Iron & Nail Co., Niles, O., is planning additions to its two mills for the near future.

The New Castle (Pa.) Tube Works are being enlarged. Additional building room and four new annealing furnaces are being provided.

The Bath Iron Works, of Bath, Me., will build a new foundry, 150 x 130 feet. It will have every improvement and be equipped with a 20-ton electric traveling crane.

Negotiations have been opened with the Wagoner Mfg. Co., Hamilton and Sidney, O., for the removal of its foundry and machine shop to Muncie, Ind. The company makes a specialty of lathes.

The Shenango Mineral Wool Co., of Wheatland, Pa., proposes to increase the capacity of its plant, and offers have been received from different towns, including sites, bonuses, etc., with a view to its removal.

The Weston Engine Co., Painted Post, N. Y., recently enlarged its works and increased its foundry capacity. It is at work on an outside contract for 1,000 tons of castings. Its working force has been increased 30 per cent.

McIntosh, Hemphill & Co., Pittsburg, have purchased a ract of land o n the Allegheny Valley Railroad and next week will break ground for a new plant which will turn out a patent cold-rolled steel car truck. The new industry will represent $300,000 worth of buildings and equipment.

The Penn Steel Casting Co., of Chester, Pa., will erect an addition which will double the capacity of the molding room. It will be 120x105 feet, and will have a new electric crane and a high speed auxiliary crane. A new foundry is being built and the chipping room will probably be extended.

An addition has been made to the main building of the Canton (O.) Rolling Mill Co., making it 110 x 190 feet. A shear house and a wareroom have also been added, and two new annealing furnaces put in. The company recently re-elected the old board of directors. The officers are: W. W. Irwin, president; D. H. Townsend, vice-president; E. L. Burchfield, secretary; M. F. Taylor, assistant secretary; R. W. Jones, treasurer; R. A. Wilson, manager.

New Construction:—

Plans for the Hassell Iron Works, Colorado Springs, Col., are completed. Work will begin at once. The foundry will be 52 x 60.

The proposed plant of the Grey Iron Casting Co., Mt. Joy, Pa., will include a foundry building 150 x 60 ft., machine shop 100 x 40 ft., and a warehouse 100 x 33 ft.

Plans have been drawn for a mammoth car house to be built by the Cleveland Electric Street Railway Co. It will be 520x120 feet, of steel and brick, with slate roof. Its capacity will be 180 cars.

The Kilbourne & Jacobs Mfg. Co., Columbus, O., has just completed a large new warehouse 100x145 feet, in order to accommodate the large increase in the demand for its wrought steel sinks.

The Ontario Car & Truck Co. recently incorporated at Oswego, N. Y., has purchased a site 125x496 feet and will erect a large modern plant this spring. It will manufacture cars, trucks, ventilators, heaters, etc.

The Champion Blower and Forge Co., Lancaster, Pa., has contracted for a 300 x 40 ft. building, taking the place of the plant destroyed by fire in January. At present the company occupies temporary buildings.

The new Concord & Montreal shops to be built by the Boston & Maine Railroad, at Concord, N. H., will occupy 28 acres of land. The buildings will take up five acres and will include a boiler and erecting shop 410x70 ft., two machine shops 305x 305x30 ft., a blacksmith shop 60x150 ft., a storehouse and offices 150x40 ft., a lumber shop 300x400 ft., a dry house 75x25 ft., a woodwork shop 300x60 ft., a power and boiler shop 85x60 ft., a cabinet, pattern and tin shop 200x40 ft., a passenger repair shop 163x170 ft., a freight repair shop 162x170 ft., and a paint shop 238 by 50 ft.

R. Hoe & Co., of New York City, manufacturers of printing presses, have placed an order with the Berlin Iron Bridge Co., of East Berlin, Conn., for an all-steel building for storage purposes. It will be 40′ wide and 60′ long, three stories high and fireproof. To avoid condensation of moisture, the roof and sides are lined with the Berlin Co.'s patent anti-condensation

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick.

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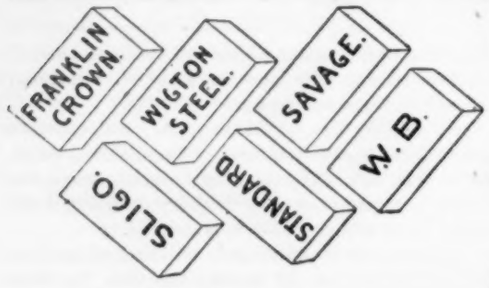

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Rolling Mills, Steel Works, Blast Furnaces, Cupola Linings, Boiler Settings.

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Ground or Calcined Clay in Sacks or Bulk.

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fireproof lining on the under side of the corrugated iron covering. The floors are concrete, supported by corrugated iron arches resting on I beams. A traveling crane is attached to the trusses, having a capacity of three tons, and so arranged that it takes the material to be raised in the building from the the lower floor and raises it to any part of the building on any of the floors. It is a very conveniently arranged and compact storehouse.

General Industrial Notes:—

Vesuvius furnace, at Ironton, O., has blown out.

At Lebanon, Pa., Colebrook Furnace No. 1 has blown out.

The Rock Run Iron & Mining Co., Rock Run, Ala., blew in its furnace on March 10.

The Sharpsville furnace, Sharpsville, Pa., has gone out of blast and extensive repairs will be made.

The Alice Furnace, Sharpsville, Pa., made 201 tons of iron one day last week, its largest output in a single day.

The Youngstown Steel Co. has been putting in an additional stove at its furnaces. Three others are to be added.

Rosena furnace, at New Castle, Pa., is now in shape to go into blast again. The second Weimer blowing engine is being installed.

L. M. Kelley, assignee of Mosley & Co., Elgin, Ill., manufacturers of lathes, chucks and watchmakers' tools, has advertised the plant for sale.

The contract for 16 400 h. p. boilers for the Northwestern Elevated road of Chicago, was let last week to the Babcock & Wilcox Co., of New York.

The Salem (Va.) Improvement Co. and the Virginia Development Co. have purchased the Salem furnace at public sale for $100,000 in favor of the bondholders.

Isi Rauh, formerly Cincinnati representative of the Excelsior Heater Co., of Chicago, has been made manager of the company with offices in the Rookery, Chicago.

The Lorain Foundry Co., Lorain, O., has decided to increase its capital stock from $40,000 to $100,000. The enterprise will be on a larger scale than was at first contemplated.

The Cornwall anthracite furnaces, at Cornwall, Pa., built in 1859 and owned by the Lackawanna Iron & Steel Co., of Scranton, Pa., are being dismantled. These stacks were abandoned some years ago, and were afterwards used as roast-

U. BAIRD MACHINERY CO.

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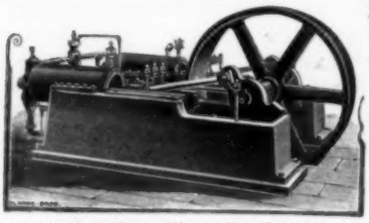
Have a Special Lot of Second-Hand Tools. All in First-Class Condition.

2—No. 10 Sturtevant Pressure Blowers.
1—55″ Allen Riveter.
1—24″x12′ New Haven Engine Lathe.
1—38″x14′ New Haven Engine Lathe.
1—Bement Car Axle Lathe.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
4—No. 1 Brown & Sharpe Screw Machines.
2—15″ Hendey Shapers.
1—Newton Column Milling Machine.
4—No. 11 Brown & Sharpe Milling Machines.

AND MANY OTHERS.

We have all the best makes of New Tools. Send for Second-Hand List.



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Now ready, machinery and process by which all small or flux ores can be prepared in any shape or size desired, ready for the cupola or furnace, at a very small cost.

Experts pronounce this invention most valuable, furnishing an inexpensive method for utilizing the soft and waste ores and thus reclaiming a large percentage of the most superior minerals.

For terms, machinery, territory, etc., address

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STEEL CASTINGS.

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We are now prepared to place licenses for the use of the WALRAND LEGENISEL process, and to undertake the design and construction of plants with supervision of preliminary operation. The process can be seen in operation at the works of POTTER & HOLLIS FOUNDRY CO., This process is unequaled for the manufacture of solid and flawless steel castings or for any purpose requiring sound masses of steel.

OFFICE, 525 ROOKERY, CHICAGO.

ers for the Colbrook furnaces. No. 1 stack was 38x12, built in 1854, and No. 2 stack, 38x13.

Negotions are under way for the starting up of the Columbia Iron & Steel Co.'s plant at Uniontown, Pa., in the next few months. New York capital is figuring on refitting and improving the property.

The Bellaire Steel Co., Bellaire, O., expects to have its new mill ready for operation by the middle of April, and will be prepared to fill orders for sheet and tin plate bars, bridge plates and steel skelp.

The Paducah Iron Co.'s furnace at Paducah, Ky., has been sold at public auction to E. C. Lackland, secretary of the company for $47 000. The sale was under foreclosure of a $70,000 mortgage held by St. Louis men.

The works of the Anderson Iron & Bolt Co., Anderson, Ind., have been taken from the receiver's hands and are now operated by the company. J. R. Brunt, who was the reeeiver, is now manager. He has paid off $30,000 of debt in two years.

Recent crane shipments of Speidel & Roeper, Reading, Pa., include three 5-ton, 26-foot span cranes to the National Tube Works Co., McKeesport, Pa. A 20-ton, 50-foot span crane is now being built for the Niles Tool Works Co., Niles, O.

One of the Carnegie Steel Co.'s new furnaces at Duquesne, will be ready for blast about the middle of May, and the second will be ready about June 1. Furnaces 3 and 4 are now being erected, together with two cast houses, engine and boiler houses.

The receivers of the Baltimore & Ohio propose to increase the working time at all the principal shops on the line of the road. Orders have been given, putting the employees at the shops at Cumberland, Md., on full time 10 hours, instead of eight hours a day.

The King Bridge Co., of Cleveland, has closed a contract with the Pittsburg & Conneaut Dock Co., to extend the plant at Conneaut. Four of the King hoisting and conveying machines for loading ore and coal have been contracted for and will be completed June 1.

Wm. Baragwanath & Son, Chicago, have recently sold feed water heaters to the Globe Iron Works, Cleveland, 200 horse power; P. C. Olarsen, Chicago, 450 horse power; Turner Bros., Ravenna, O., 500 horse power and the American Glucose Works, Peoria, Ill., 125 horse power.

The Morris Ball Pulverizer Co., of Cleveland, has been incorporated to make and deal in rock breakers, ore crushers, pulverizers and other machinery. The incorporators are: W. D. Dayle, John N. Frazee, W. A.

Reade, Perry Prentiss, and John W. Morris. Capital, $10,000.

At Boston, the failure of the old firm of L. T. Pratt & Co., is announced. The several failures among firms with whom Pratt & Co. did business are given as the cause.

The Frank & Kneeland Machine Co., Pittsburg, is building a 22-inch merchant mill for the Bay View plant of the Illinois Steel Co. It is also building one of its 4½ x 4½-inch lever shears, weighing 50 tons, which will be equipped with a 30-inch knife for cutting heavy plate, and will be especially adapted for use in cutting various kinds of scrap.

The bids opened March 13 for section 4 of the Boston subway were for two classes of steel—one (A) rods and plain beams, and two (B) built beams, the quantities in the order named being 200 tons and 350 tons. The bids were: New Jersey Steel & Iron Co.—A, $48 per ton; B, $44.60 per ton. Passaic Rolling Mill Co.—A, $45.60; B, $49. A. P. Roberts Co., Pencoyd Iron Works—A, $50.20; B, $46. Pennsylvania Steel Co.—A, $45.88; B, $51.88. Edge Moor Bridge Works, Wilmington, Del.—A, $47; B, $52. The aggregate of the several bids was as follows: New Jersey Steel & Iron Co., $25,210; Passaic Rolling Mill Co., $26,270; A. P. Roberts Co., $26,140; Pennsylvania Steel Co., $27,334; Edge Moor Bridge Works, $27,600. The bids were taken under advisement.

The Buffalo Forge Co., Buffalo, N. Y., received under date of March 11, a letter from Rev. A. B. Storms, of the Case Avenue Methodist Episcopal Church, Detroit, saying that the Buffalo fan system in use in that church, "not only heats the building evenly and with ease, but keeps the air pure and without disagreeable drafts of cold air." Rev. Wellsley H. Bowdish, pastor of Embury Memorial M. E. church, Brooklyn, writing on March 11, says that the Buffalo fan system in use in that church "is the most perfect for heating and ventilating I have ever known. This system works in both church and parsonage like a charm. This I have said to others who have written me upon the same subject." The Stamford, Conn., high school is also heated and ventilated with Buffalo apparatus. The chairman of the building committee, Schuyler Merritt, writing to the engineering firm of Regent & Lynch, who installed it, says: "It gives me pleasure to say that the heating and ventilating apparatus installed by you in the Stamford High School has proven to be entirely satisfactory. There has been no difficulty in keeping the school warm and the air has at all times been fresh. I say this with more confidence, because the principal of the school is quite particular on this point, and I should certainly have had it called to my attention if the contrary had been the case, so that experience confirms my own observation."

The Greenfield Steam Engine Works, W. G. and G. Greenfield proprietors, East Newark, N. J., report business most satisfactory, with good prospects that it will continue so. They recently received orders for 17 Greenfield upright engines and seven presses within a period of 10 days, the orders coming from Mexico, Belgium ane Pennsylvania.

Steam Yachts and Marine Machinery,

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

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Fan System Heating and Ventilation.

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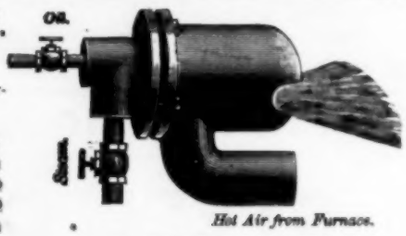

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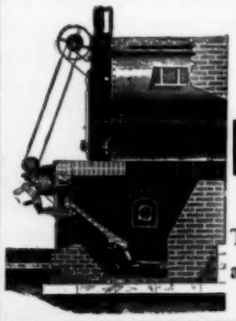

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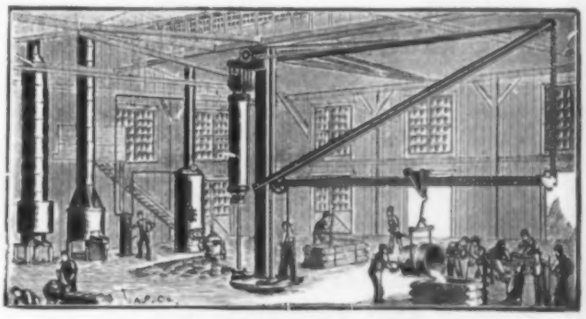
Yes, That Was a Bad Mistake You Made

Went to all the great expense of the runway, etc., and got that traveller which cost you $6,000 and find you can't get your work out because the traveller can't be at both ends of the shop at once. The molders can't wait like the machinists and do something else till the crane comes, and here you must go to work and spend another $6,000 for another traveller. O dear! And $6,000 bills are not sticking around any too plenty. Takes lots of hustling to get $6,000 now 'days.

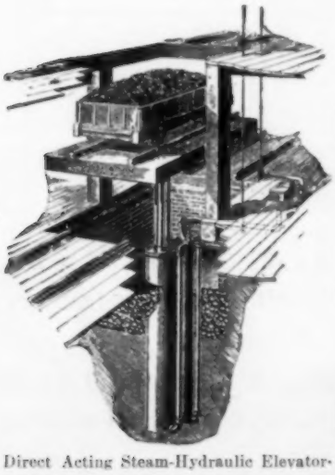


5-ton Steam-Hydraulic Crane in a Foundry.

Well, don't cry. No use crying over spilled milk. You are not so awful bad as far as you've gone. Don't go any further. Get a Ridgway Crane or two and stick along the runway. They needn't be very big ones, 5 tons will do seeing you already have the traveller for heavy lifting. These RIDGWAY CRANES don't cost much and you can do your molding of particular work under them. They will put up the work for you fast and insure it good when poured. Traveller can be a handy fellow of all work wherever needed. It was a pity you wasted that $6,000, but you need not waste another. You thought a foundry was like a machine shop, but it isn't.

Or, if you already have the two travellers, then get a RIDGWAY CRANE and stick it in some corner. If the note you gave to pay for the traveller is a long-time one, or you can get it renewed by paying a little on it, the RIDGWAY CRANE in the corner will in all likelihood save enough money for you to pay it when due.

It's a great Money Maker in a Foundry, this Ridgway Crane.

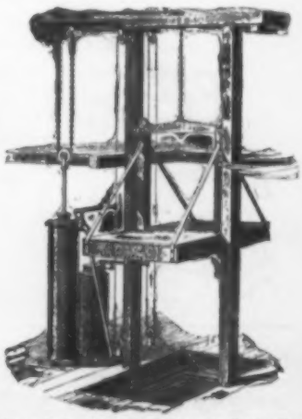


Direct Acting Steam-Hydraulic Elevator.

PLEASE

Take the Elevator.

NO TWO OPINIONS ABOUT IT, ONLY A MATTER OF PRICE.



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Our tubes are hot drawn, without weld or seam; from the best quality of steel, in lengths from 8 to 25 feet, and of any degree of hardness, from .08 to .60 carbon —They are equal in every respect, except finish, to cold drawn tubes and are offered at a much lower price.

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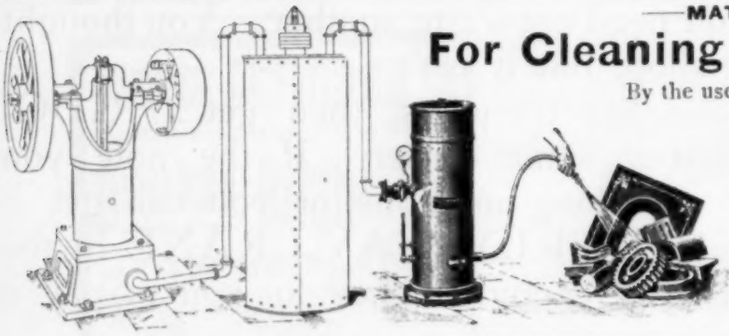
For Cleaning Castings, Forgings, etc



By the use of common, sharp, dry sand, and with a compressed air pressure of 15 lbs., this Apparatus will **Clean** all forms of castings **more thoroughly** than is possible by hand, for **half the total cost**, and in a space of time that cannot be conceived until the machinery has been seen in actual operation. For small castings a special tumbling barrel is worked in connection with the Sand Blast Apparatus. For further particulars apply to

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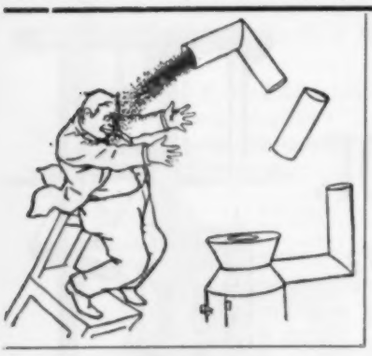

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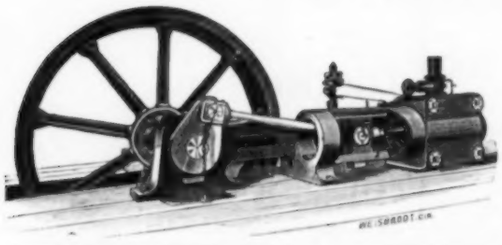

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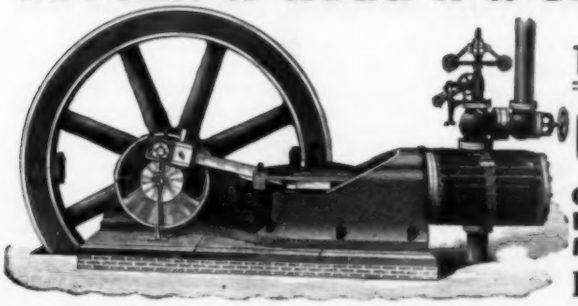

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The best engine for any service where high economy and close regulation are desired. Compact in form and durably constructed Specially adapted to driving electric generators direct connected and by belt. Also for rolling mill work.

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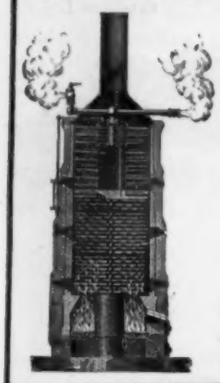

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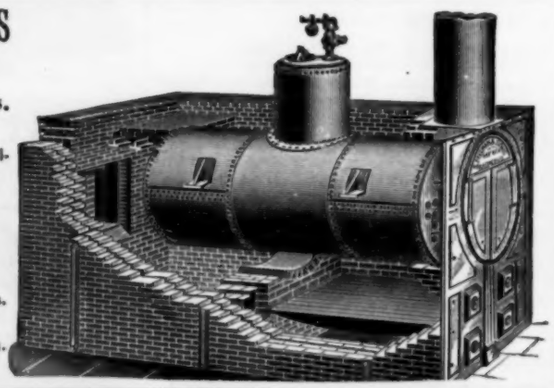

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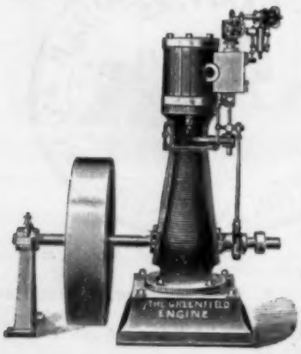

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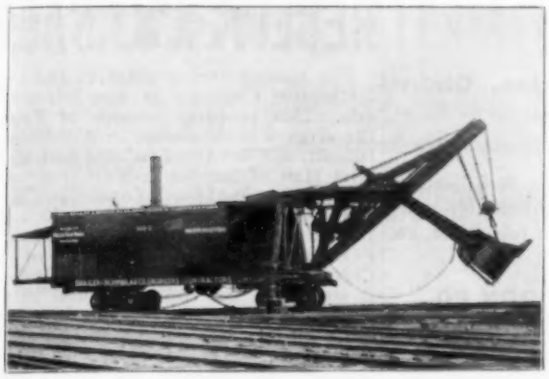

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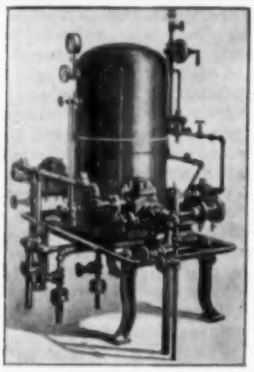

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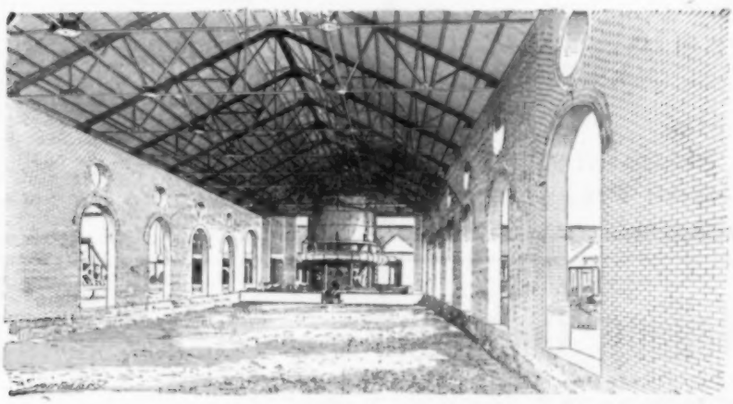

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RECEIVER'S SALE.

The manufacturing plant of the Joliet Enterprise Company is now offered for sale. This property consists of Twenty (20) acres of land, situate in Will County, Illinois, and described as that part of the East Half of the North-West Quarter of Section Twenty (20), Township Thirty-five (35) North and of Range Ten (10) East of the Third Principal Meridan, as lies between the right-of-way of the Chicago, Rock Island & Pacific Railway Company on the North and the Illinois and Michigan Canal, including its reserve strip, on the South, together with all the buildings and improvements situate thereon, and the tools, machinery, appliances, boilers, engines and other articles of personal property, situate in said buildings or located upon said property, heretofore obtained, used and employed for the purpose of carrying on, on said real estate, a manufacturing business, such as was carried on by the Joliet Enterprise Company, prior to the appointment of the Receiver, together with all right, title and interest of said corporation, George M. Fish or the Receiver in and to the Capital Stock of the Columbia Wire Company and Columbia Patent Company or both, with all rights and privileges thereunder, it being the intent and purpose to sell all said real estate and other property as a whole, undivided and as a manufacturing plant and so convey the same.

This sale is by the direction of the Circuit court of Will County, Illinois, which has had jurisdiction of the Joliet Enterprize Company and its assets for over three years, in a suit to wind up the corporation and distribute its assets among its creditors and under a decree for a sale without redemption, which has already been affirmed by the Supreme Court of the State of Illinois.

This plant is modern and complete in all its appointments having been operated only about ninety (90) days. The capacity of the plant is Two Hundred (200) tons and upwards of rods per day. It has One Hundred (100) drawing blocks, Seventy-five (75) barbed wire fence machines, Eight (8) bale tie machines, Thirty-six (36) wire nail machines. Its location is the best and just outside the City limits of the city of Joliet. Freight rates are the same as Chicago. The buildings are constructed of brick on stone foundations. On the North it is connected with the Chicago, Rock Island and Pacific Railway and on the South with the Illinois and Michigan Canal. There is nearly a mile of side tracks along side of and connected with this property. The warehouse is in a safe location and is One Hundred and Twenty (120) by Four Hundred (400) feet in size. The machine shop is large, and thoroughly equipped with all modern machinery and appliances. The buildings are heated by steam and the mill is supplied throughout with fire pipes, hose and chemical engines, and is lighted by electricity, the electrical plant being situate on the premises. In addition to water supply from the Canal, it has a large artesian well of the best quality of water for domestic and steam purposes. The mill has full privileges and protection under the patents of the Columbia Wire Company.

The sale will be made for cash and without redemption, free of all mechanics liens or other liens of parties to the cause in which the Receiver is appointed.

Sealed bids for this property will be received by the undersigned, as such Receiver, up to Twelve o'clock Noon of April 8th, 1896. The bids will be turned over to the Court and will be opened in Court at One-thirty o'clock P. M. of said day and then made public. A certified check on some National Bank for Five Thousand Dollars ($5,000) payable to the order of the Receiver, must accompany each bid

The Court expressly reserved the right to reject any and all bids.

An inspection of the mill may be had and any further information obtained by application to the undersigned, as such Receiver, at Joliet, Illinois. March 4th, 1896.

GEORGE H. MUNROE, Receiver.

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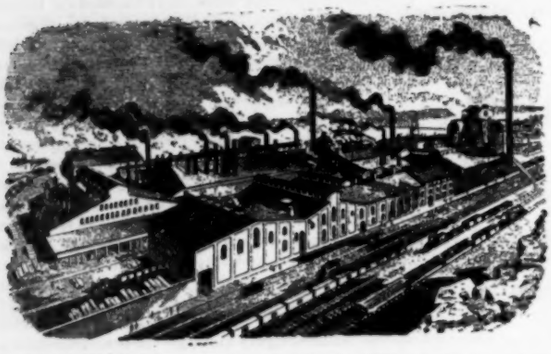

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—AND WE—
ROLL and SHEAR PLATES to DIMENSIONS. Write Us.

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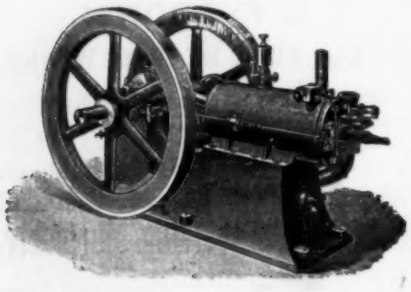

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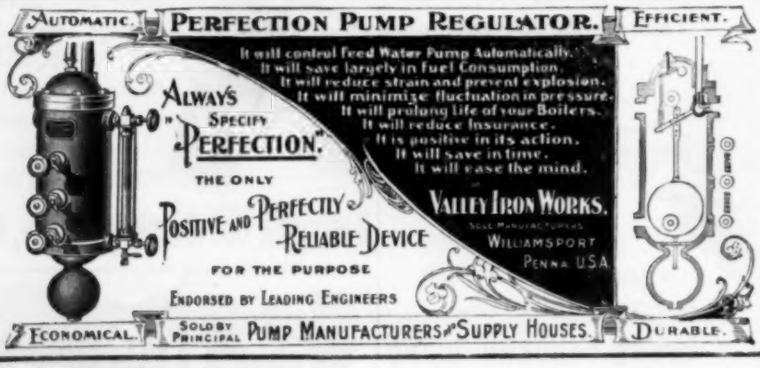
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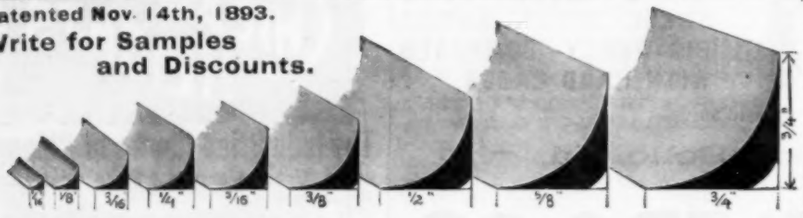

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COMPLETE DIRECTORY

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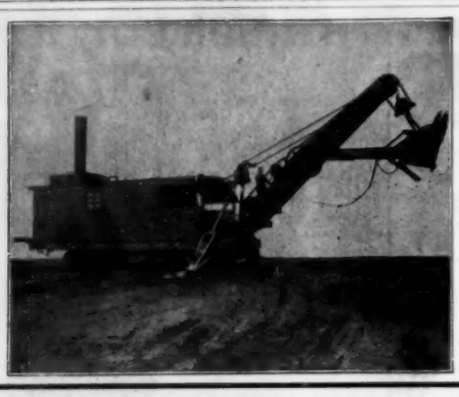

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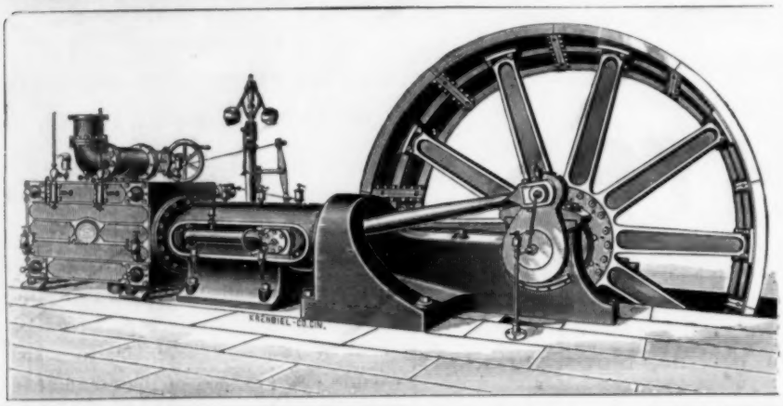

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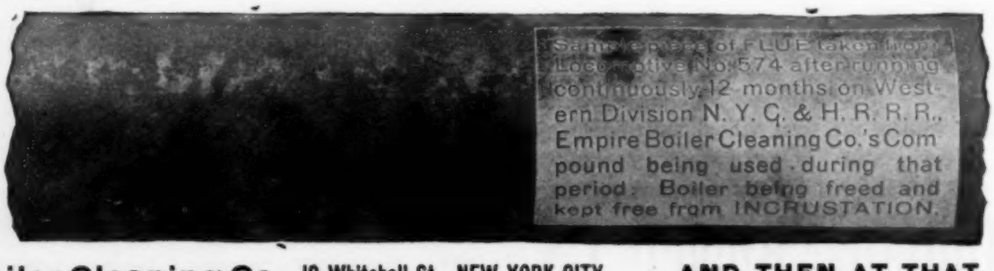
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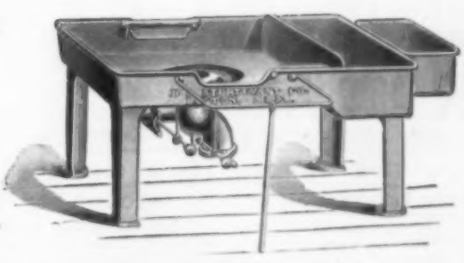

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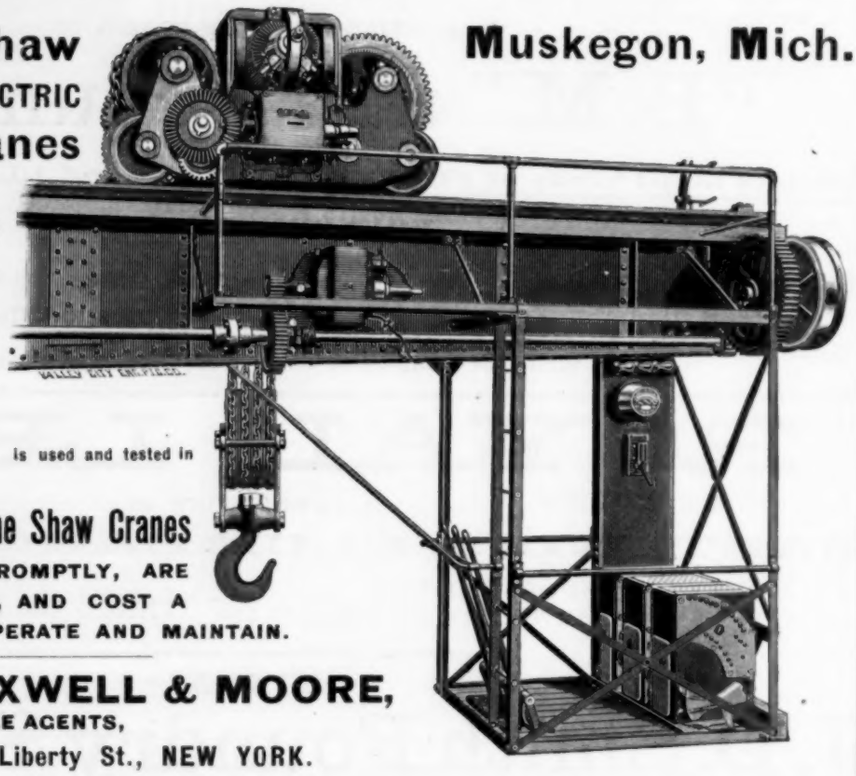

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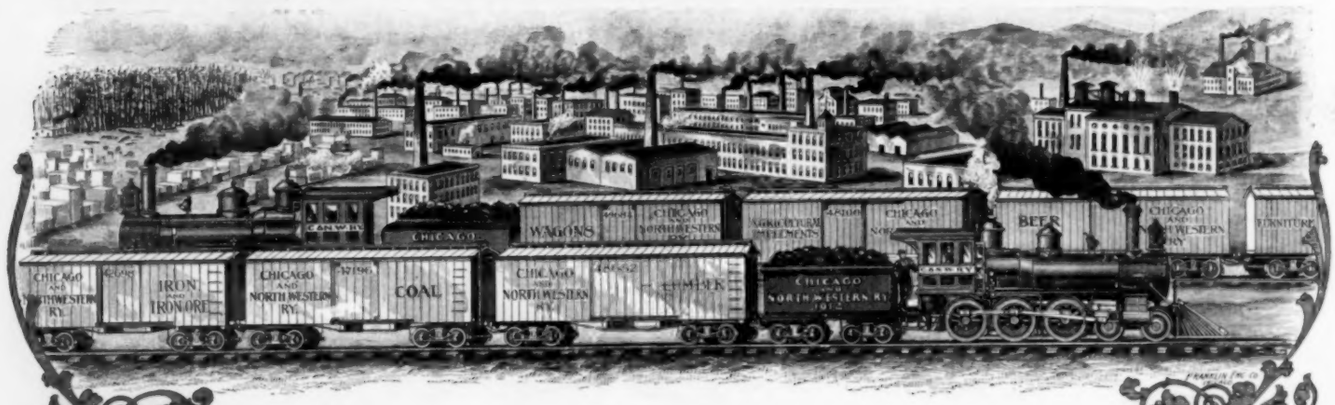

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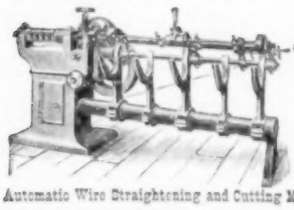

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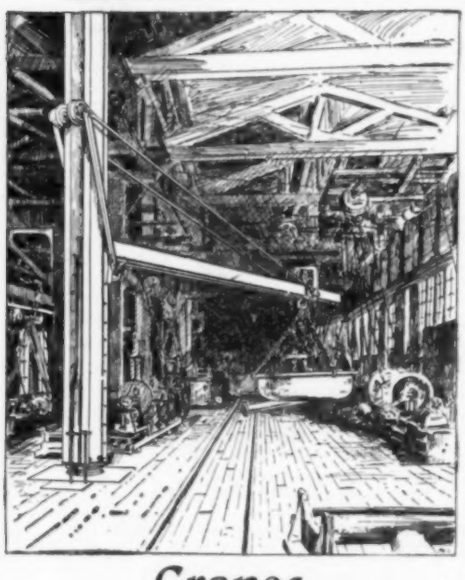

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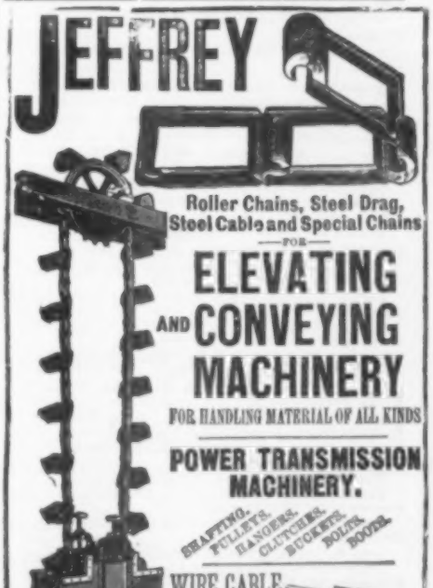

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American Hoist & Derrick Co., St. Paul, Minn.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.
Berlin Iron Bridge Co., East Berlin, Conn.

Iron Nails and Steel—
Weber & Co., Cincinnati, O.
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co, Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
Wm B Scaife & Sons, Pittsburg, Pa.
Ætna-standard Iron & Steel Co, Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Iron Ore, Bar and Pig Iron—
Pittsburg Steel & Iron Mfg. Co., Pittsburg, Pa.
Oglebay, Norton & Co., Cleveland.
Condit-Fuller Co., Cleveland.
E. C. Pope, Cleveland.
Forster, Waterbury & Co., Chicago, Ill.
Central Iron & Steel Co., Brazil, Ind.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.
Cambria Iron Co., Johnstown, Pa.

Iron Shutters and Doors—
The Cincinnati Corrugating Co., Piqua, O.

Iron Working Tools—
Prentiss Tool & Supply Co., Chicago, Ill.
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
John Adt & Son, New Haven, Conn.
Diamond Machine Co., Providence, R. I.
Bement Miles & Co., Philadelphia, Pa.
U. Baird Machinery Co., Pittsburg, Pa.
The Wright Co., Lowell, Mass.
C. H. Haeseler & Co., Philadelphia, Pa.
The L. S. Starrett Co., Athol, Mass.
Skinner Chuck Co., New Britain, Conn.
Springfield Machine Tool Co., Springfield, O.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY

PITTSBURG, PA.

The Largest and Most Completely Equipped Electrical Manufacturing Establishment in the World.

POWER, INCANDESCENT AND ARC LIGHTING, FROM THE SAME CIRCUITS.

We have purchased and are the **sole owners** of the patents issued to Nikola Tesla for the **Polyphase Alternating System,** now recognized to be the most successful system for lighting and power purposes.

We furnish complete lines of apparatus for the perfect equipment of **isolated plants** for Hotels, Office Buildings, Flats and Factories.

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For distribution of lights and power in **large Manufacturing Establishments, Mills and Mines.**

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The most durable, economical and efficient on the market.

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TACOMA, WASH., 102 S. 10th St.

PITTSBURG, Westinghouse Building.
BUFFALO, Erie County Bank Building.
PHILADELPHIA, Girard Building.
ST. LOUIS, American Central Building.

CHARLOTTE, N. C., 23-38 College St.
SYRACUSE, N. Y., Bastable Building.
SAN FRANCISCO, Mills Building.
WASHINGTON, D. C., 1333 F. St. N.
AHEARN & SOPER, OTTAWA, CANADA.

Link Belting—
The Jeffrey Mfg. Co. Columbus O.
Link-Belt Machinery Co. Chicago, Ill.

Lathes—
Prentiss Tool & Supply Co., Chicago, Ill.
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
The Wright Co., Lowell, Mass.
Springfield Machine Tool Co., Springfield, O.

Machinists' Tools and Supplies—
Prentiss Tool & Supply Co., Chicago, Ill.
H. Bickford, Lakeport, N. H.
Davis & Egan Machine Tool Co., Cincinnati, O.
C. H. Besly & Co., Chicago, Ill.
Armstrong Bros. Tool Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
The L. S. Starrett Co., Athol, Mass.
American Tool Works, Cleveland, O.
Skinner Chuck Co., New Britain, Conn.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati
C. H. Haeseler & Co., Philadelphia, Pa.
Springfield Machine Tool Co., Springfield, O.

Machine Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Hamilton Fdy. & Machine Co., Hamilton, O.
Springfield Machine Tool Co., Springfield, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Manufacturers' Advertising—
United States Mailing Co., Cleveland, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metallic Lath—
The Cincinnati Corrugating Co., Piqua, O.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Milling Machines—
Prentiss Tool & Supply Co., Chicago, Ill.
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.
Link-Belt Machinery Co., Chicago, Ill.

Motors—
Westinghouse Electric & Mfg. Co., Pittsburg.

Molding Sand—
Ohio Sand Co., Conneaut, O.

Nickel—
Canadian CopperCo., Cleveland, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.

Packing—
C. H. Besly & Co., Chicago, Ill.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York City.

Pattern Leather Fillet—
Canton Leather Fillet Co., Canton, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Planers—
Prentiss Tool & Supply Co., Chicago, Ill.
Davis & Egan Machine Tool Co., Cincinnati, O.
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Pittsburg Steel & Iron Mfg. Co., Pittsburg, Pa.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Portable Drills—
C. H. Haeseler & Co., Philadelphia, Pa.

Power Presses—
Springfield Machine Tool Co., Springfield, O.

Portable Forges—
Buffalo Forge Co., Buffalo, N. Y.
Cady Mfg. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Presses—
Springfield Machine Tool Co., Springfield, O.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
Link-Belt Machinery Co., Chicago, Ill.

Pulley Blocks—
Moore Mfg. & Foundry Co., Milwaukee, Wis.
American Hoist & Derrick Co., St. Paul, Minn.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.

Pumps (Steam)—
W. G. & G. Greenfield, East Newark, N. J.
Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Willis Shaw, 416 N. Y. Life Bldg., Chicago.

Pump Regulators—
Valley Iron Works, Williamsport, Pa.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Retort Coke Ovens—
Semet-Solvay Co., Syracuse, N. Y.

Rock Breakers—
American Hoist & Derrick Co., St. Paul, Minn.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.
Totten & Hogg I. & S. F'dry Co., Pittsburg, Pa.

Rolls—
Samuel Tretheway & Co., Pittsburg, Pa.

Roofs—
Berlin Iron Bridge Co., East Berlin, Conn.
The Cincinnati Corrugating Co., Piqua, O.

Roofing Plates—
Morton Tin Plate Co., Cambridge, O.
The Cincinnati Corrugating Co., Piqua, O.

Rust Preventatives—
Otto Goetze, New York City.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Sand Blast Machines—
Ward & Nash, Chicago, Ill.

Saws—
Peter Gerlach & Co., Cleveland.

Schools—
International Correspondence Schools, Scranton, Pa.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.

Scrap Iron & Steel—
Klein & Cohn, Cincinnati, O.

Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.

Second-Hand Machinery—
Prentiss Tool & Supply Co., Chicago, Ill.
American Tool Works, Cleveland, O.

Semi-Steel—
McDowell Steel Co., Chicago, Ill.

Shapers—
Springfield Machine Tool Co., Springfield, O.

Shafting—
Finished Steel Co., Youngstown, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Ætna-Standard Iron & Steel Co., Bridgeport, O
The Cincinnati Corrugating Co., Piqua, O.

Smoke Consumers—
American Smokeless Furnace Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.

Skylights—
Translucent Fabric Co., Quincy, Mass.

Stacks—
Wm. B. Scaife & Sons, Pittsburg, Pa.

Stamping and Punching—
Cady Mfg. Co., Cleveland, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Vulcan Iron Works Co., Toledo, O.
Vulcan Iron Works, Chicago, Ill.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.

Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
The Johnson Co., Johnstown, Pa.
Potter & Hollis Foundry Co., Chicago, Ill.
McDowell Steel Co., Chicago, Ill.

Steel Knives—
Samuel Tretheway & Co., Pittsburg, Pa.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Steel Shafting—
Finished Steel Co., Youngstown, O.

Steel Tanks—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Berlin Iron Bridge Co., East Berlin, Conn.

Stokers—
Playford Stoker Co., Cleveland, O.

Structural Engineers—
Berlin Iron Bridge Co., East Berlin, Conn.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Central Iron & Steel Co., Brazil, Ind.

Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.
Enterprise Boiler Co., Youngstown, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

Telephones—
Universal Telephone Co., Indianapolis, Ind.

Time Detector—
Nanz & Co., New York.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Gummey, McFarland & Co., Philadelphia, Pa.
Morton Tin Plate Co., Cambridge, O.
Atlanta Steel & Tin Plate Co., Atlanta, Ind.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Torches—
Dangler Stove & Mfg. Co., Cleveland, O.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
C. H. Besly & Co., Chicago, Ill.

Tube Welding—
S. Fix Sons, Cleveland.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.

Ventilating Fans—
American Blower Co., Detroit, Mich.

Watchman's Time Detector—
Nanz & Co., New York.

Welding Compound—
Cornelius S. Mitchill, New York City.

Wheelbarrows—
Lansing Wheelbarrow Co., Lansing, Mich

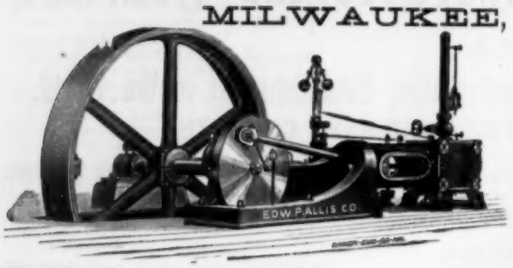
Wire Nails—
Salem Wire Nail Co., Salem, O.

Wire Rope—
American Hoist & Derrick Co., St.
Roberts Steel Chain Belting Co., Pittsburg.

Wire Machinery—
Cady Mfg. Co., Cleveland, O.
John Adt & Son, New Haven Conn.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.

Reynolds Patent Vertical Boilers.

Reynolds Corliss Engines.

NEW YORK, Room 1111 Havemeyer Bldg.
CHICAGO, Room 509, Home Ins. Bldg
MINNEAPOLIS, Room 416, Corn Exchange.
DENVER, 1316 18th Street.
SAN FRANCISCO, 31 Main Street.
PITTSBURG, 702 German National Bank Bldg.
SALT LAKE CITY, Desert Bank Bldg.
KANSAS CITY, Armour Bldg.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@ 5.00
No. 1 Bessemer hematite	3.75@ 4.25
Hematites No. 1 non-Bessemer	2.25@ 2.75
No 1. Specular, non-Bessemer	2.75@ 3.25

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$12 50@ 12 75
No. 1 Strong Foundry	12 00@ 13 25
No. 2 Strong Foundry	12 50@ 12 75
No. 1 Gray Forge, red short	11 25@ 11 50
No. 2 Gray Forge, neutral	10 75@ 11 00
No. 1 American Scotch	13 25@ 13 50
No. 2 American Scotch	12 75@ 13 00
Lake Superior Charcoal	13 50@ 14 25
PITTSBURG:	
No. 1 Foundry	$13 00@ 13 25
No. 2 Foundry	12 50@ 12 75
Gray Forge	11 00@ 11 25
White and Mottled	10 50@ 10 75
Warm Blast Charcoal	15 00@ 16 00
Cold Blast Charcoal	20 00@ 22 00
Bessemer	12 25@ 12 40
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	12 50@ 13 00
Local Coke Foundry No. 2	12 00@ 12 50
Local Coke Foundry No. 3	11 00@ 12 00
Local Scotch Foundry No. 1	12 50@ 13 00
Local Scotch Foundry No. 2	12 00@ 12 50
Local Scotch Foundry No. 3	11 00@ 12 00
Southern Coke No. 1	11 8 @ 12 35
Southern Coke No. 2	11 35@ 11 60
Southern Coke No. 3	10 35@ 11 35
Southern No. 1 Soft	11 35@ 11 60
Southern No. 2 Soft	11 10@ 11 35
Southern Silveries No. 1	11 85@ 12 35
Southern Silveries No. 2	11 60@ 11 85
Jackson Co. Silveries	14 50@ 16 00
Ohio Silveries No. 1	15 00@ 15 50
Ohio Silveries No. 2	14 50@ 15 00
Ohio Strong Softeners	15 00@ 15 50
Alabama Car Wheel	16 85@ 17 35
Malleable Bessemer	@ 13 00
Coke Bessemer	13 00@ 14 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$11 00@$11 25
Southern Coke No. 2 and No. 1 Soft	10 25@ 10 50
Hanging Rock Coke, No 1	12 50@ 13 50
Hanging Rock Charcoal No. 1, Fdy	16 00@ 17 00
Tennessee Charcoal No 1	13 50@ 14 00
Jackson County Silvery No 1	14 00@ 14 50
Southern Coke, Gray Forge	9 25@ 9 50
" " Mottled	9 00@ 9 25
Standard Alabama Car Wheel	15 75@ 16 25
Tennessee " "	14 50@ 15 00
Lake Superior " "	14 50@ 15 00
BUFFALO (reported by Rogers, Brown & Co.)	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$13 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	13 00
Ohio Strong Softener No. 1	13 70
Jackson Co. Silvery No. 1	15 25@ 15 75
Lake Superior Charcoal	14 00@ 14 50
Southern Soft No. 1	12 25
Hanging Rock Charcoal	18 00
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$12 00
Southern Coke No. 2	11 50
Southern Coke No. 3	11 00
Southern Gray Forge	10 50
Southern Charcoal No. 1	15 00
Missouri Charcoal No. 1	14 00@ 15 00
Ohio Softeners.	16 00
Lake Superior Car Wheel	15 00
Southern Car Wheel	16 25

OLD RAILS AND SCRAP METAL.

	GROSS TONS
Old iron rails	$16 25
Old steel rails	12 00
Old car wheels	13 00
	NET TONS
No. 1 R. R. wrought scrap	$12 75
Mill scrap	10 00
No. 1 Machine cast scrap	10 00
Iron axles	16 50
Axle turnings	9 00
Wrought turnings (free from cast)	8 00
Cast borings	7 00
Uncut wrought iron boilers	5 00
Steel boiler plates	10 00
Grate bars	6 50
Pipes and flues (clean)	8 50
Tank iron	9 00
Hoop and band iron	7 00
Sheet iron	6 50
Wrought drillings	7 50
Malleable iron	9 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.49c@1.54c	
Angles	1.34c@1.39c	
Tees	1.49c	
Universal Plates	1.45c	
Sheared Plates	1.55c	

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ⅛ to 1 inch	1 60
4½ to 6 by ⅛ to 1 inch	1 65
1½ to 6 by 1⅛ to 2 inch	1 65
1¼ & 1⅜ by ⅜ to ½ inch	1 40
1 & 1⅛ by ⅜ to ⅝ inch	1 50
⅝, ¾, ⅞, by ⅜ to ⅝ inch	1 60

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.
THE CADY MFG. CO.
18, 20 and 22 Johnson St., CLEVELAND, O.

SEND FOR OUR NEW CATALOGUE OF Power Presses, Drop Hammers, Punches and Shears, Wire Working and Special Machinery.

PERFORATED METALS
OF ALL KINDS FOR
MILLING MINING AND AGRICULTURAL MACHINERY,
PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.
THE ROBERT AITCHISON. PERFORATED METAL CO.,
OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

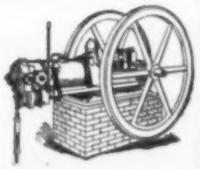
A. H. LEITCH, PREST. JOHN C. LEITCH, SEC. AND TREAS

WESTMORELAND FIRE BRICK CO.
MANUFACTURERS OF HIGH GRADE FIRE BRICKS.
PITTSBURG, PA.
Works and Mines, Westmoreland, Pa.

DIXON'S GRAPHITE PAINT
FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL.
Tin roofs well painted have not required repainting for 10 to 15 years.
If you need any paint it will pay you to send for circular.
JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

THE BROWN HOISTING AND CONVEYING MACHINE CO. CLEVELAND, O.
MACHINERY FOR HANDLING COAL AND ORE.
CRANES
NEW YORK. HAVEMEYER BLDG.
PITTSBURG. CARNEGIE BLDG.
CHICAGO. MARQUETTE BLDG.

POWER From GAS OR GASOLINE.
No Steam, Coal, Ash, Gauges, Engineer nor Danger.
From 1 to 250 horse-power. } Can be Used in City or Country.
THE OTTO GAS ENGINE WORKS, Inc.
33d and Walnut Sts., PHILADELPHIA, PA.
S. M. York, 42 S. Water St., Cleveland Agent. Over 45,000 Sold.



IRON CLAD PAINT CO.
Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND OHIO.

ORDER DIRECT FROM THE Iron Clad Paint Co.
And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.
IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.
FURNISHED both Dry and Ground in Oil
USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅜ inch	1 40
2 to 2¾ inch	1 60
2⅞ to 3¼ inch	1 55
3⅜ to 4 inch	1 90
4¼ to 4½ inch	2 50
4¾ to 5 inch	2 70

Oval.

⅜ to 1¼ inch	1 60
⅜ to ¾ inch	1 60
½	1 80
⅝	2 00

Half Oval and Half Round.

1⅛ to 3 inch	1 95
⅜ to 1⅛ inch	1 75
⅜ to ¾ inch	2 00
½	2 15
⅝	3 25

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	1 50
1 to 1⅜ by ¼ and 5-16 inch	1 55
⅜ to ⅝ by ¼ and 5-16 inch	1 65
½ to ⅝ by ¼ and 5-16 inch	1 90

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 75
1 7-16 to 2, No. 17, 18 and 19	1 80
1 7-16 to 2, No. 20	1 90
1 7-16 to 2, No. 21	2 00
1 7-16 to 2, No. 22	2 10
1⅛ to 1⅜, No. 13, 14 and 15	1 80
1⅛ to 1⅜, No. 16, 17 and 18	1 85
1⅛ to 1⅜, No 19 and 20	1 90
1⅛ to 1⅜, No. 21	2 00
1⅛ to 1⅜, No. 22	2 10
15-16 and 1 inch, No. 13, 14 and 15	1 75
15-16 and 1 inch, No. 16, 17 and 18	1 90
15-16 and 1 inch, No. 19 and 20	2 00
15-16 and 1 inch, No. 21	2 10
15-16 and 1 inch, No. 22	2 20
⅞, No. 13, 14 and 15	2 00
⅞, No. 16, 17 and 18	2 10
⅞, No. 19 and 20	2 20
⅞, No. 21	2 30
⅞, No. 22	2 40
13-16, No. 13, 14 and 15	2 10
13-16, No. 16, 17 and 18	2 20
13-16, No. 19 and 20	2 30
13-16, No. 21	2 40
13-16, No. 22	2 50
¾, No. 13, 14 and 15	2 20
¾, No. 16, 17 and 18	2 35
¾, No. 19 and 20	2 45
¾, No. 21	2 55
¾, No. 22	2 65
11-16, No. 13, 14 and 15	2 45
11-16, No. 16, 17 and 18	2 50
11-16, No. 19 and 20	2 60
11-16, No. 21	2 70
11-16, No. 22	2 80
11-16, No. 23	2 90
⅞, No. 13, and 15	2 50
⅞, No. 16, 17 and 18	2 60
⅞, No. 19 and 20	2 70
⅞, No. 21	2 80
⅞, No. 22	2 90
⅞, No. 23	3 00
9-16, No. 13, 14 and 15	2 70
9-16, No. 16, 17 and 18	2 80
9-16, No. and 20	3 90
9-16, No. and	2 00
9-16, No. 221	3 10
9-16, No. 22	2 20
7-16 and ½ inch, No. 13, 14 and 15	3 90
7-16 and ½ inch, No. 16, 17 and 18	3 00
7-16 and ½ inch, No. 19 and 20	3 10
7-16 and ½ inch, No. 21	3 20
7-16 and ½ inch, No. 22	3 30
7-16 and ½ inch, No. 23	3 40
⅝, No. 13, 14 and 15	3 40
⅝, No. 16, 17 and 18	3 50
⅝, No. 19 and 20	3 60
⅝, No. 21	4 90
⅝, No. 22	4 00
⅝, No. 23	4 15

Light Band.

1⅛ to 6 by ⅛ to 3-16 inch	1 60
1⅛ to 6 by Nos. 11 and 12	1 65
1 to 1⅜ by ⅛ to 3-16 inch	1 65
1 to 1⅜ by Nos. 11 and 12	1 70
⅜ and 13-16 by ⅛ to 3-16 inch	1 80
⅜ and 13-16 by Nos. 11 and 12	1 75
¾ and 11-16 by ⅛ to 3-16 inch	1 90
¾ and 11-16 by Nos. 11 and 12	1 95
⅞ and 9-16 by ⅛ to 3-16 inch	2 05
⅞ and 9-16 by Nos. 11 and 12	2 10
½ by ⅛ to 3-16 inch	2 20
½ by Nos. 11 and 12	2 25

Wagon Box Iron.

⅛ inch, beveled edge, by Nos. 11 and 12	1 80
⅛ inch, " " " " 13 and 14	1 90
¼ inch, " " " " 11 and 12	1 95
¼ inch, " " " " 13 and 14	1 35

Sheet Iron.

No. 10	1 60
No. 12	1 70
No. 14	1 80
No. 15-17	1 90
No. 18	2 05
No. 20	2 20
No. 22-24	2 30
No. 25 26	2 40
No 27	2 50

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 45
Shell	1 60
Flange	1 70
Marine Flange	2 00
Fire Box	2 50

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ⅞ in. "	08

ÆTNA-STANDARD IRON AND STEEL COMPANY,

BRIDGEPORT, OHIO,

MANUFACTURERS OF

TIN AND TERNE PLATE, Iron and Steel Plates and Sheets, Plain Black, Painted, Corrugated and other forms of **ROOFING, SIDING and CEILING.** Patent Leveled Galvanized Sheets, **BARS,** Light Section Rails, **ANGLES,** Tees, Channels, and other Miscellaneous Bars and **SHAPES.**

WITH SUCH DIVERSITY OF PRODUCT,

SPECIAL ADVANTAGES are offered buyers of mixed lots, effecting saving in freight charges and by reason of our LARGE STOCKS, securing **PROMPT SHIPMENT.**

INQUIRIES INVITED AND CATALOGUES MAILED ON APPLICATION.

ROBERTS STEEL CHAIN BELTING CO., Pittsburg, Pa.

Elevating and Conveying Machinery

For Handling all kinds of materials.

Special Wrought and Steel Chains of every description; Coil and Cable Chains; Chain Haulages for Coal Mines; Sprocket Wheels; Complete Coal and Ashes Handling Plants; Wire Rope Haulages and Wire Rope.

W. H. COFFMAN COKE CO.

BLUEFIELD, W. VA.

GENERAL FACTORS AND SHIPPERS OF

POCAHONTAS FLAT-TOP COKE.

So low in ash that it requires no fluxing for foundry purposes. Our foundry and furnace coke was awarded the first premium at the World's Fair in 1893.

AVERAGE ANALYSIS OF COKE.

Moisture	00.196	Sulphur	00.677
Fixed Carbon	93.625	Ash	05.004
Volatile Matter	00.494		

Foundry, Furnace and all sizes of crushed coke. Guaranteed lower in Sulphur than any other commercial coke

STEEL CASTINGS

FROM 10 LBS. UPWARD.

Made from Best Open-Hearth Steel.

ALSO SAND ROLLS AND CAST-IRON PINIONS.

SEND FOR ESTIMATES.

THE JOHNSON COMPANY, Johnstown, Pa.

COMBINE SAFETY WATER TUBE BOILER
L. M. MOYES, MANUFACTURER, PHILADELPHIA, PA.

GARDEN CITY FOUNDRY CO.

INCORPORATED.

Successors to **TURNER, DICKINSON & CO.**

Armitage and Central Avenues, Station G, Chicago, Ill.

FRICTION CLUTCHES, HANGERS, PILLOW BLOCKS & PULLEYS.

Large Stocks on Hand. Shipments Promptly Made.

Subscribe for the Iron Trade Review, $3 per year.

7-16 to ⅜ and 2⅜ to 3 in.	.09
3⅜ to 4 in.	.09½
⅜ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10¼
¼ to 9-32 and 6¼ to 7 in.	.11
7 ⅛ in	.13

Flats.

	cts. ₱lb
2 to 9-16 in. wide by 2 to ⅝ thick	.8

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 50
Open-hearth Tire	"	1 80
Open-hearth Spring	"	2 20
Sleigh Shoe	"	1 90
Toe Calk	"	2 10
Cutter Shoes, tapered and bent	"	2 20

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam	3 00

Wrought Pipe and Boiler Tubes.

Lap weld black, base	dis. 65
Butt " " "	dis.
Lap " galv. "	dis. 5
Butt " " "	dis. 50
Boiler tubes 2¼" and smaller	dis 62½
Boiler tubes 2½" and larger	dis. 65
Casing screw and socket joint	dis. 52½
Casing inserted joint	dis. 47½

MACHINERY SUPPLY MARKET.

Anvils.

American	₱ lb 9@10
Wright's	₱ lb 12

Bellows.

Blacksmiths' Hill's	dis 40
Blacksmiths' Bullock's	dis 50&10
Moulders'	dis 40@40&10
Hand	dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 4
Standard, oak tanned	dis 50&1
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis
Horton's Universal	dis
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis
" " Gear Cutters	dis

Crowbars.

Cast Steel	₱ 3½
Iron, steel points	₱ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

SHIFFLER BRIDGE COMPANY,

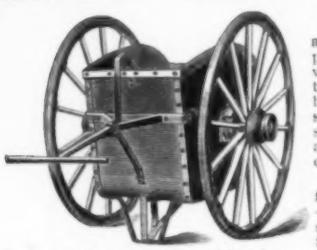
BUILDING DEPARTMENT.

SPECIALTIES: STEEL AND IRON BUILDINGS FOR ROLLING-MILLS TIN PLATE PLANTS, STEEL WORKS, FOUNDRIES, FACTORIES, ROOF TRUSSES, GIRDERS, COLUMNS, BEAMS, CORRUGATED IRON, ETC.

Main Office and Works:
48th Street and A. V. Ry.
PITTSBURG, PA.

Branch Offices:
1123 Betz Building, Philadelphia, Pa.
65 Dexter Building, Chicago, Ill.
228 Lumber Exchange, Minneapolis, Minn.

Steel Ore or Charging Cart



This cart is largely taking the place of the charging barrow, and is used in place of them by the newest and best equipped plants. The weight of the load is directly on the axle and is very easily dumped. Owing to the large diameter of the wheels, the large load is easily carried. Body made of No. 8 steel, banded around top with ¼x1½ in. iron. To stiffen sides and support axle, a ¼-in. steel sheet 12x24 in., and a ⅜-in. steel sheet 6 in. square is securely riveted to inside of body. The axle passes through the center of each sheet and through the cart, and is riveted to body by iron hangers.

A steel shield is riveted to body over axles to prevent dirt from getting into the wheel-boxes and cutting them. Wheels—First quality wagon wheels 48 in. in diameter, painted, striped and varnished; 1½x½-in. tire; 14 spokes. Axles—Steel 1¼ in. square. Body—Width, 24 in., height, 33 in; length, 40 in. Handle—1¾-in. iron. Legs and Braces—⅜x1½-in. and ½x1½ in. Weight, complete about 540 lbs. Telegraph name, Slate. (3)

Lansing Wheelbarrow Co., Lansing, Mich.

STUART FIRE BRICK CO.

MANUFACTURERS OF
Silica Brick
For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.
Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

W. J. McKINNIE, Pres. W. A. MADISON, Sec'y and Treas.

THE PLAYFORD STOKER

A perfect smoke preventing furnace; perfect combustion, minimum of expense, simple in construction and economical.

A test of three tubular boilers of Cleveland Water Works, made Oct. 4th, 1895, by a waterworks engineer, shows an evaporation of over ten pounds of water to one pound of nut coal, and during the test the stack was entirely free from smoke.

The PLAYFORD STOKER CO., 919 SOCIETY FOR SAVINGS CLEVELAND, O.

Semi-Steel Castings

34,000 TO 38,000 TENSILE STRENGTH.

Process Owned by
THE McDOWELL STEEL CO.,
Room 902, Mallers Bldg., - - CHICAGO, ILL.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	*5:45 pm
Akron, Columbus & Zanesville	†12:45 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

The Cleveland Terminal & Valley R. R Co.

Depot foot of So. Water St.
City Office 137 Superior St.

	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.

CHICAGO HEIGHTS

The Industrial Centre of Chicago

offers **Free Factory Sites** and other inducements.

If you are seeking a new location it will pay you well to investigate the merits of our proposition.

Chicago Heights Land Association
M. H. KILGALLEN, Gen'l Mgr. CHICAGO

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, F. FF.
Kegs, ℔	4½c	5 c	2½c
½ kegs ℔	4¾c	5¼c	2¾c
¼ kegs ℔	5 c	5½c	3 c
10 ℔ cans, 10 in case	6 c	6¼c	5 c
10 ℔ cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 50@50&5
H. H. Barton ..... dis 50@50&5

Emery Wheels.

Detroit ..... dis 60@70
Norton's ..... dis 60@70
Grant ..... dis 60@70
Sterling ..... dis 60@70
Celluloid ..... dis 10&33⅓
Northampton ..... dis 50
Crystal ..... dis 65@70
Vitrified ..... dis 60@70
Vulcanite ..... dis 60&10
Hamden ..... dis 60&10@75
Cyclone ..... dis 60@60&10

Files.

Arcade ..... dis 60&10@60&10&10
Nicholson ..... dis 60&10@60&10&10
" X. F ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
McClellan ..... dis 60&10@60&10&10
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50
Industry File Works Hand Cut ..... dis 50

Hammers.

P. S. W ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 12c
" " " " over 5 lbs. 10c

Jack Screws.

Illinois Bolt Co. list ..... dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15½	11⅛	8½	6	5⅛	5½	
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887 ..... dis 85
Standard Penny Nails, ℔ keg card rate
Car lots $2.25
Less than car lots $2.35

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz. ..... dis 10@10&10

Picks.

Railroads, 5 to 6 lbs. ..... $12 dis 60
" 6 to 7 lbs. ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 50
Medart Pulleys ..... dis 50
Split Wood Pulleys ..... dis 55@60

Pulley Blocks.

Moore's Anti-Friction Differential Chain Pulley Block ..... dis 20

Rivets.

Iron, Thousand, list November 1, 1894 ..... dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894 ..... dis 60@65
Copper ..... dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in. ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list ..... dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in. ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 55
Pulley Taps ..... dis 40

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 15@20
Howard ..... dis 35

Wire.

New List, Apr. 9, 1894

Brass ..... dis 4c
Copper ..... dis 4c
Bright and annealed, Nos. 0@18 ..... dis 70&10@75
" " Nos. 19@26 ..... dis 75@75&5
" " Nos. 27@36 ..... dis 75&10&5
Coppered Nos. 0 to 18, market list ..... dis 70@70&5
Galvanized Nos. 0 to 18 " " ..... dis65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... 95c ℔ lb dis 30

Wrenches.

Coe's genuine ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanic's ..... dis 55&10&5
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 65
Billings & Spencer's Drop Forged ..... dis 25
William's " " ..... dis 25
Alligator " " ..... dis 40

Perforated Filter Press Plates.

THE HARRINGTON & KING PERFORATING CO. CHICAGO.

BRONZE SCREEN PLATES To withstand action of ACIDULATED WATERS.

PERFORATORS OF STEEL, IRON, COPPER, ZINC, BRASS AND TIN.

For use in GRAIN CLEANING AND MINING MACHINERY, WOOLEN, COTTON, PAPER AND PULP MILLS, RICE, FLOUR AND COTTON SEED OIL MILLS, SUGAR AND MALT HOUSES. DISTILLERIES, FILTER PRESSES. STONE, COAL, AND ORE SCREENS, BRICK AND TILE WORKS, FILTERS, SPARK ARRESTERS, GAS AND WATER WORKS, OIL, GAS AND VAPOR STOVES, COFFEE MACHINERY, ETC.

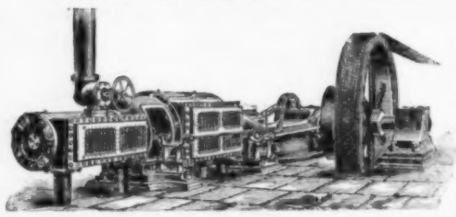
STANDARD SIZES PERFORATED TIN AND BRASS ALWAYS IN STOCK.

Main Office and Works, 222 to 240 No. Union St., Chicago, Ill., U. S. A. Eastern Office, No. 284 Pearl St., New York.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Williams Improved Vertical Engines

For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y. E. F. WILLIAMS. 1025 Monadnock B'ld'g, Chicago. ALBERT FISHER.

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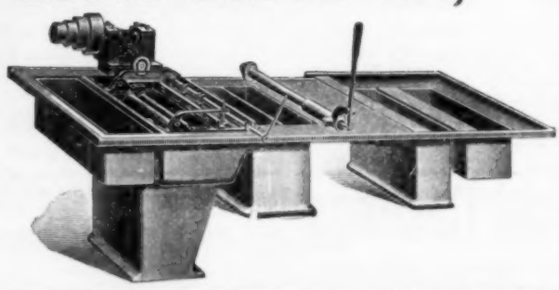

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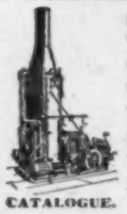

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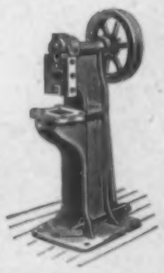

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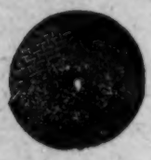

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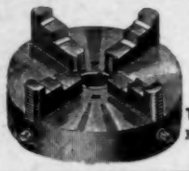

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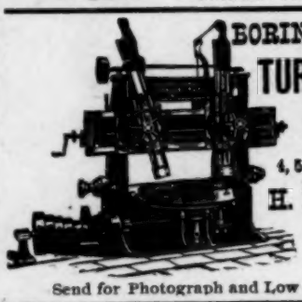

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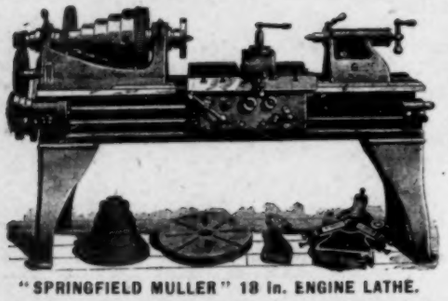

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